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Railway Mechanical Engineer

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Selling Bonds to Ready Buyers

By the time this will have appeared in print the Third Liberty Loan Campaign will be well under way, following its auspicious launching Saturday, April 6, on the anniversary of the entrance of the United States into the great world war. In this campaign the railwaymen who subscribed for 20 million in bonds in the first campaign and 36 million in the second are expected quickly to exceed their former total. Three committees of railroad presidents have been formed—one for each regional district —and every railroad man from the head office down is expected to do his share. The mechanical department officers, particularly, have a clearly defined work to do in the campaign, and in many ways they have a compensating advantage that officers in some of the other departments do not have, for their men are together and can be easily reached. What is this work that every mechanical department officer should take advantage of this opportunity to do? (1) To subscribe himself until it hurts; (2) to hold shop meetings to advertise to the men the necessity of subscribing; (3) to solicit the men personally in so far as possible to get their names on the subscription blank dotted line and (4) to lose no chance to push home the seriousness of the war to the remaining few who do not understand what America stands for in this conflict. It is somewhat difficult to believe that there are any Americans left who do not realize what our being in the war means and it is equally hard to believe that there are still Americans who do not understand the sterling worth of Liberty Bonds or realize the unsurpassed opportunity they offer to save money for oneself and help the government. In short, in most cases, it is only a case of clinching the selling argument. Let us see now what success the mechanical department will have in helping railroad men beat easily their totals in the other two campaigns!

Equipping Foreign Cars With Safety Appliances

The date set for the completion of the work of equipping cars with safety appliances, as required by law, has recently been extended to September 1, 1919. Energetic measures will be needed to finish the work within the time allowed. Reports recently submitted by the railroads show that on October 1, 1917, out of 2,572,363 cars owned by the roads, there remained to be equipped 181,611 cars, or more than 7 per cent of the total number owned. On some roads more than 60 per cent of the cars are still without the required safety appliances; on other roads less than 1 per cent require this work to be done.

The experience of the roads has shown that as the percentage of cars equipped increased it became difficult to find cars without safety appliances that could be brought to the repair track, and consequently toward the end the work progressed quite slowly. The roads have almost without exception equipped only their own cars. The removal of the restrictions regarding the movement of cars has resulted in a much smaller proportion of equipment remaining on the home lines than was formerly the case, and has also increased the length of time the equipment stays off the home road. It is evident that the work cannot be completed within the time allowed unless it is done on foreign lines as well as on the home road.

The roads should make arrangements at all repair points to take care of any cars requiring safety appliances that come on the repair track, whether home or foreign. As practically all the cars built before the safety appliance law went into effect were wooden cars, the work can usually

be done even where the facilities for steel car work are poor. In applying the grab irons and sill steps, any arrangement that meets the requirements of the Interstate Commerce Commission may be applied.

Competent and Adequate Shop Supervision

Statements have been made to the effect that it is exceedingly difficult to retain or obtain men in the capacity of foremen. With the increase in the labor turnover and the decrease in the efficiency of labor, a sufficient number of competent foremen is more than ordinarily necessary at this time. In most such cases much sympathy cannot be given to the complaining roads. The salaries of the supervising officers and foremen have in a large number of cases not kept pace with the increases in wages to the workmen. When a man in the capacity of a foreman gets less than some of the men under him, it is but natural that he should complain and accept positions paying more or even prefer to return to the ranks. It is a serious problem and should be given careful consideration by every mechanical department organization. The railroads need now as never before competent and active foremen if shop production is to be maintained and brought up to a point which will bring the locomotives back into proper condition. It is expected that such conditions will be improved with the report of the Railroad Wage Commission and those foremen who are dissatisfied with their existing conditions should wait for this report before making any changes.

An Economy Clause in Locomotive Specifications

In the concluding part of the article on Intensive Locomotive Development, which will be found on another page of this issue, the author says: "It is an astonishing situation that the railway industry has not long ago established the practice of calling for certain guaranteed economical performances of new locomotives or even locomotive devices and of running a series of performances or acceptance tests to see whether or not these guarantees are being met." While we cannot altogether agree with the author that the failure to demand guaranteed economy of performance is to be wondered at, we do heartily agree that such a practice is highly desirable and that this is a good time to begin to prepare for its ultimate establishment.

That the economy of motive power performance has not been given the attention in the railroad field which it has received in other industries is probably owing to the fact that motive power development has been in the direction of constantly increasing capacity, because train loading has a more direct and more tangible bearing on ton-mile costs than the horsepower-hour economy of the locomotive. Then there are other conditions, such as the extent of the standby losses, which have an important bearing on the cost of coal on a ton-mile basis and that are beyond the control of the locomotive designer. With the rising cost of coal and, what is of greater importance, the growing economic value of coal, the need of highly economical performance is becoming so great that it must receive much more attention than has been given to it in the past. At present it is doubtful if there is a builder in the country, perhaps not even a designer, who could intelligently meet a coal economy guarantee if one were inserted in the specifications. There is available too little exact knowledge of the effect on economy of variations in locomotive proportions.

It is becoming evident that limits of size and weight are rapidly being reached which preclude further extensive capacity increases in that direction. Further development must, therefore, be along the lines of increased economy of operation, both for its own sake and for the sake of increases in capacity. So surer foundation for the structure of such improvements can be provided than that suggested by the author of the article referred to above.

Should a "Run, Repair or Transfer" Rule Be Adopted?

Since the railroads have been under Government control it has been suggested repeatedly that the adoption of a rule requiring the receiving line to run, repair or transfer, at its own expense, cars offered to it by connecting lines, would expedite the movement of cars and have a favorable effect on operating conditions. The principal advantage which those who advocate the adoption of this rule claim for it, is a marked reduction in the number of cars transferred at interchange points.

Years ago, before the interchange of cars had been developed to the point it has now reached, the "run, repair or transfer" rule was in effect. It became apparent that this rule worked a hardship on the lines with heavy motive power and favored those with light equipment. In order to overcome this, the delivering line has been made responsible for the cost of transfer when necessary on account of defective equipment or improper loading, according to A. R. A. car service rule 15. The defects which must be repaired while the car is under load are specified in M. C. B. Rule 2, so the receiving line cannot transfer the load unless it is necessary. If cars are being transferred unnecessarily, the remedy lies not in changed rules, but in closer supervision.

There are numerous disadvantages that would result from the adoption of the run, repair or transfer rule at this time. The most important is that it would tend to make the originating line indifferent as to the condition of the equipment loaded. A large amount of freight originates on branch lines, where the trains are short and the motive power is light. A car with part of the draft bolts broken or missing may not cause trouble on such a road. To try to operate such a car in a long train would probably cause a break-in-two. If the delivering line is not held responsible for the cost of transferring the lading, it will merely maintain the cars in such condition that they will be fit to pass over its own lines, and the receiving roads, if their operating conditions require better equipment, will have to transfer far more cars than they do under the present arrangement. The effect that this would have on the already overburdened trunk lines can readily be seen. The roads are having trouble now because the shippers load equipment that is not fit to operate.

United States Standard Cars

The Railroad Administration has during the past month issued specifications and drawings showing the designs of the standard cars on which a committee has been working during the past two months. Designs have been made for the bodies of a 40- and 50-ton steel frame, single sheathed box car; a 40-ton steel underframe, double sheathed box car; a 50-ton high side steel gondola, a 50-ton high side composite gondola; a 70-ton low side steel gondola; a 55-ton hopper car and a 70-ton hopper car. Three designs of trucks having capacities of 40 tons, 50 tons and 70 tons have been provided to use on the standard car bodies. These cars have been designed to have adequate strength and sufficient interchangeability, so that repairs may be easily made and the amount of material to be carried in stock at both the builders' plants and on the railroads may be kept to a minimum. A study of the drawings, which are shown elsewhere in this issue, will show the extent to which the material of which these cars are made is interchangeable. Of special interest is the extent to which pressed steel parts have been used in an endeavor to reduce the requirements of the structural steel shapes. While structural steel shapes have been used, the number of sections involved in the designs is small. This will permit of buying such material in large quantities for the various designs on which it is to be used.

The Railroad Administration has been broad in the matter of the specialties to be used. The draft sills have

been arranged to take the Cardwell, Murray, Sessions type "K," Westinghouse and Miner draft gears, provided they come within the limiting dimensions specified in the specifications. An outside all-steel roof is to be used, either of the Murphy, Hutchins or Chicago-Cleveland type. Steel ends are specified of either the Murphy, vertical corrugated or plain steel ends. The M. C. B. standards have been used to a large extent, including the type "D" coupler and the No. 2 and No. 3 brake beams. The truck sides permit of using the arch bar for the 40- and 50-ton and cast steel for all truck capacities. The latter, however, must be of U-section and meet certain specifications for strength. In all cases limiting dimensions are provided, so that where specialties are used, they must be made to fit these dimensions. This simplifies the repair problem to a large extent. Inquiries for 100,000 of these cars have been made by the Government, and the prices of the builders have, it is understood, been submitted. The supply men have also been interviewed by the purchasing department of the Railroad Administration and bids asked for the various parts which they are able to furnish.

The Transfer of Locomotives

The extraordinary traffic congestion which began seriously to cripple several of the eastern roads at the beginning of last winter, made it essential that more motive power be obtained from any available source for use on these lines. The borrowing of locomotives from some of the less congested western lines was resorted to in the emergency and the practice has been extended until at the present time there are probably at least 600 foreign locomotives in operation on various railroads in the eastern and southeastern sections of the country. These locomotives were obtained partly from other railroads, partly by diverting new locomotives as they were delivered from the builders, and partly by the use of United States Army and Russian Decapod locomotives made available by the United States government. While this method of relieving a very serious situation was wholly justified, there is now evident a tendency to carry the practice of shifting locomotives from road to road to extremes which must result in considerable confusion and loss of efficient service. Locomotives of one road are being scattered about among several other railroads, and on the other hand the roads borrowing locomotives, instead of receiving all of their power from one or two lending roads, are getting a miscellaneous collection of one or two locomotives each from several different lines. This situation no doubt has been the result of a lack of competent supervision of the details of the practice, if indeed any attempt has been made at co-ordination.

There are at least three fundamental considerations which should receive attention when such transfer is contemplated. First, the locomotives should be kept as near the owning road as possible, preferably on a division of a connecting line adjoining the owning road. Second, all of the locomotives borrowed from any one railroad should be kept together if the exigencies of the demand for power will permit, and each borrowing road should be furnished with the locomotives from as few other lines as possible. Third, more careful attention should be given to clearance limitations than apparently has been done in some of the transfers which have been made. Attention to the first two considerations will materially reduce the confusion and delays arising in the effort to secure a reasonable stock of repair parts for the borrowed locomotives. It will be much simpler for a railroad to protect its borrowed locomotives if they are all of one class, or at least all have come from one line, than if each one is different from the others. Furthermore, the drain upon the store stock of the loaning railroad will be reduced and its locomotives will be better maintained if they are kept together when away from home.

If these fundamentals are to receive the consideration which they deserve the whole practice of transferring locomotives must be placed under the supervision of one central agency. The agency to which it most logically belongs is the Locomotive Section of the Federal Railroad Administration. In the office of the manager of this section is available much of the information required for a co-ordinated handling of the transfers and his organization is in a position to secure such other information as may be necessary. Only through such handling of the matter can the present confusing situation be straightened out and worse confusion avoided in the future. At most the practice of shifting locomotives from one road to another is but an emergency measure and it is highly desirable that the locomotives be returned to the owning roads at the earliest possible moment.

The Railways Lack Proper Repair Facilities

One of the contributing causes to the great lack of sufficient motive power during the past winter was the inadequate and insufficient repair facilities. Locomotives cannot be expected to run indefinitely without repairs and repairs cannot be made without proper repair facilities. There is not a motive power officer in the country but will say, "Give me better and more shops in which to repair my locomotives and you will not need to buy so many new ones." One road owning over 2,000 locomotives estimates that over $10,000,000 should be spent to bring its repair facilities up to the point where it can properly maintain them. Another road owning about 1,500 locomotives has a capacity for repairing only 750. Some of the best roads in the country are crying for additional shop capacity. It is the question of the hour in both the mechanical and engineering departments of the railroads. The need for new and improved shops should be driven home to the director general with sledge hammer blows. The Railroad Administration must be made to realize that with all the cars and locomotives it is considering purchasing, it must provide means for properly maintaining them.

It has been said that Mr. McManamy as manager of the Locomotive Section, in charge of locomotive repairs, has one of the biggest jobs on the Railroad Administration Board, but he says, "*We* have the biggest job to do"—and "*We*" it is, for he can not get results without the hearty co-operation from every mechanical department man in the country. The output of the shops must be increased by working longer hours, and in some cases roads have brought their hours up to 70 per week, in accordance with the suggestion of Mr. McManamy. That the output of shops has materially increased is shown from a report of 101 of the principal roads of the country, which in February, 1917, repaired 6,824 locomotives. In February of this year 8,390 locomotives were repaired, or an increase of 1,566. While this does not accurately represent the increase in production because of the different classifications used in the different shops, it does represent the actual increase of locomotives which were repaired and put in service.

Upon the shop forces rests to a very large extent the responsibility of adequate locomotive equipment for the railways this year and particularly for next winter. A road which is perhaps very well equipped with shop facilities must not ease up on locomotive repairs simply because its power is in good shape. It must be willing and ready, by working longer hours,—and it is here that labor can show its patriotism—to assist other roads which are not in such good condition to repair their locomotives until their facilities have been improved so they can handle their own work. Transferring locomotives to other shops for re-

pairs has been done to some extent since the government took control of the railroads. About 300 have been thus transferred of which about 60 have been handled by the locomotive builders.

This practice can only be considered as a temporary expedient, to be followed until such time as those roads with the poorer shop facilities get their power into such shape and their facilities so improved that they are able to handle their locomotives in their own shops. The transferring of locomotives from one road to the shop of another road not only takes time in making the transfer, but also increases the time in which the repairs are made and the cost of the repairs. It is the plan of Mr. McManamy to so assign locomotives to foreign roads for repairs that they will not have to be sent too far away from their home lines and to concentrate the repairs of a road at one shop so that the men becoming familiar with the locomotives may repair them more promptly. Where locomotives are being sent away for repairs, it is very necessary that a careful inspection be made before they are sent. Instances have been found where repairs other than those reported were necessary and the material for which had not been forwarded with the locomotive, causing a delay of some 10 days or two weeks.

The Question of Standard Locomotives

The work being done by the Railroad Administration's committee on the development of standard locomotives is of vital importance to every railway mechanical department officer and foreman. A careful study of the situation indicates that there is no justification for the railroads of this country being asked to operate locomotives which at best can be only of a compromise design and which in the long run will be unsuited to the peculiar operating conditions of each road; moreover the roads will not be properly equipped to repair them. There is no class of railroad men that knows better the impracticability of such a scheme than the men in the mechanical department. It is the duty of every such man to thoroughly consider the situation and present his arguments to his immediate superiors. It is also the duty of the head of every mechanical department to advise his Regional Director exactly what the standard locomotives will mean to him on his road. We must all be patriotic citizens and do our utmost to help this country win the war. Every man must be a "good soldier" and do as he is told, but a man would be derelict in his duty if he did not do his utmost to prevent our country from making a mistake which would interfere with the rapid and successful prosecution of the war. It is up to every railroad mechanical man in the country to give his honest and unbiased opinion through the proper sources and in the most direct channel in order to reach the Director General.

From what is known of the Railroad Administration's plans, standard locomotives are being considered of the Mikado, Pacific, Mountain, Santa Fe, Switcher and Mallet types. Two designs of the first four types are to be built, each having 55,000 and 60,000-lb. axle load. It is believed that an 0-6-0 switcher and an 0-8-0 switcher, a 2-6-6-2 and a 2-8-8-2 type of Mallet, all with 55,000-lb. axle load, are being considered. The Mikado, Pacific and Mountain types will have the following dimensions:

Type	Cylinders	Weight on drivers	Tractive effort
Mikado	26 in. by 30 in.	220,000 lb.	54,600 lb.
Mikado	27 in. by 32 in.	240,000 lb.	60,000 lb.
Pacific	25 in. by 28 in.	165,000 lb.	40,700 lb.
Pacific	27 in. by 28 in.	180,000 lb.	43,800 lb.
Mountain	27 in. by 30 in.	240,000 lb.	57,000 lb.
Mountain	27 in. by 30 in.	220,000 lb.	53,900 lb.

While it is undoubtedly possible to use these locomotives economically on some roads of the country, it is an indisputable fact that there are many requirements which will not be met by them. In addition to this, these locomotives being of a new design, will not be common to any road and will cause considerable trouble when repairs are to be made.

There are two sides from which such a problem as this should be considered, the railroads' side and the builders' side. The effect the introduction of the standard locomotive would have on any road is fully appreciated by the readers of this paper. It will be unnecessary to enumerate in detail just what the difficulties will be, as they are fully understood by the practical railroad men. Suffice it to say, however, the standard locomotives being of a compromise design and not being adapted to any one particular set of conditions, the efficiency of train operation will be reduced. There are so many conditions, such as grades, curvature, class of traffic handled, the coal used, water conditions, etc., that enter into the problem of locomotive design, that where these are all averaged in a compromise design, as good results cannot be obtained as where locomotives are constructed specifically to meet these conditions.

The question of the difficulty of making repairs to the standard locomotives will be appreciated by our readers. New patterns, dies, templates, etc., will be required with which to make the repair parts. There will be many details in the construction of the standard locomotives which will be entirely different from those in vogue on the roads on which these locomotives will be used. This will create confusion, and make the repairs more costly both in money and in time. New facilities will have to be created for making the repairs to heavier locomotives than the roads, in many cases, have been accustomed to handling in their repair shops. The repair situation is extremely critical as it is, and it would be inexpedient further to complicate it.

From the builders' standpoint it has been argued by some that the locomotives can be built cheaper and more rapidly if they are standardized. The saving in first cost is open to serious question. For instance, take the Mikado type locomotives purchased during the past year. Three hundred and sixty-seven were of weights lower than the weight of the standard Mikado being considered. By adding to the weight of these 367 locomotives, it has been found that about 10,000,000 more pounds of iron and steel will be required to meet these requirements with the standard locomotives. At 15 cents per pound for locomotives, this means an increase in the first cost for these 367 locomotives of $1,500,000. The same argument will apply to all of the other types and it is safe to say that many thousand tons of metal will be used unnecessarily and that the locomotives will cost many millions of dollars more than if they were built to meet the specific requirements of the roads. Thus the saving in first cost is open to serious question, no matter how far the government may force down the prices of both the locomotives and the specialties used on them.

In regard to the increased output, it has been stated by those who are in a position to know, that after the first of April every day's delay in ordering locomotives will mean that the country will lose ten locomotives in production. This is caused by the fact that some of the locomotive builders have open space in June and July, which it will be impossible to fill, even if orders are placed at this time. The delay, therefore, occasioned by the development of standards for the locomotives is causing a decrease in our yearly production. It cannot be said at the same time that this delay is unnecessary. It is impossible to perform successfully such a gigantic task as the Railroad Administration has set for the Locomotive Standards Committee in the space of one month, or even two months. The question is of such vital importance to all the railroads of this country that a much longer time should be taken.

If the roads were permitted to buy locomotives which suit their needs and which they are organized to repair, far better results will be obtained and locomotives could be produced without delay.

INTENSIVE LOCOMOTIVE DEVELOPMENT

Why Not Require Guaranteed Minimum Economy of Performance and Check with Acceptance Tests?

BY CAPT. O. S. BEYER, JR.*

PART II

STEAM UTILIZATION

UNDER this heading there are several problems which deserve attention. It is perhaps in this department more than in any other that most has been accomplished in recent years. This has resulted from the perfection of the superheater. But the field is by no means exhausted.

Further Study of the Superheater.—In the first place, the superheater itself deserves further investigation. The work done at Purdue, and especially that at Altoona with varying numbers, lengths and diameters of superheater units has certainly contributed most valuable knowledge to this subject. As a continuation of this work, the correlation between degree of superheat and boiler pressure as reflected in the steam economy of the engines should be worked out over wider ranges and mathematical determinations verified.

Another very important question coming within this field is the effect of varying degrees of moisture in steam on superheat. Some recent tests have confirmed the fact that, when the large modern locomotive boiler works at high capacities, the steam entering the throttle contains much more moisture than when working at light capacities. Apparently a distinct relation exists between rate of evaporation and dryness of steam in the dome. This condition has its own distinct effects on the performance of the superheater. Hence it becomes very desirable to investigate this matter thoroughly. How best to deal with this condition, whether by means of a special type of separator, modified dome construction and throttle valve, or other means, will then follow logically.

Compounding of Steam Cylinders.—The possibilities of compounding the steam cylinders jointly with the use of superheated steam deserves more attention from the investigator's standpoint than it seems to be getting. The improvements in the manufacture and handling of heat treated and alloy steels, together with the increasing construction difficulties arising in the counterbalancing of heavy locomotives, to say nothing about the dawning knowledge of the extent of stresses in rails for which certain features of the steam locomotive are responsible, all make this problem one of the most important awaiting comprehensive illumination.

Valve Gears.—There are today at least five distinct types of locomotive valve gears available. Some of them claim to be steam and fuel savers or capacity increasers. To be sure, they all have certain maintenance features which warrant consideration. But when it comes down to their relative economies, no scientific data are available for comparing one with the other. When the costs involved are considered together with the far-reaching claims which are made, it is a wonder that a way has not yet been found to secure the steam distributing characteristics of each gear. It would be a service well worth rendering.

Cylinder Proportions.—Locomotive cylinders so proportioned and valve gears so arranged that the maximum cut-off possible ranges from 60 to 70 per cent deserve considerable investigation. Fortunately this is now under way. Results are eagerly awaited.

Piston and Valve Rings, Piston Head and Valve Bull Rings and Their Wear Limits.—The design, material, number and wear limits of cylinder and valve packing rings, valve bushings, piston heads and bull rings are a continual source of argument and variation in practice. There is no doubt that these small items are of a great deal of importance in the economical performance of the locomotive. What is needed is more definite and extensive data concerning the effect on the steam requirements of the engines equipped with different numbers and different kinds of rings and rings in various conditions of wear. Such tests can easily be made in the locomotive test laboratory. Similar tests can be run with piston heads and valve bull rings of various diameters (such as result from wear) smaller than the cylinders or valve chambers.

The Locomotive Valve.—The diameter, length, weight, speed and stroke of the valve at varying cut-offs have characteristic influences on the indicator card of the cylinders. This should be more completely worked out. Different types, designs, and shapes of valves as a whole might be profitably investigated together with valve bushings and sizes and shapes of port openings.

DESIGN AND CONSTRUCTION

There are investigations which can profitably be made relating to some of the practices employed in locomotive design and construction. A few of these are as follows:

Relative Movement of Boiler Parts.—The systematic study of the movements of various parts of the locomotive boiler when hot, under pressure and working, together with attempts to determine accurately the actual stresses developed, should be continued. As far as carried, this work has revealed that reactions take place which, were they entirely understood, could be controlled or eliminated and the boiler troubles usually experienced thus largely reduced.

Water Circulation in Boilers.—The matter of water circulation in the boiler is very important and little understood, especially as it exists in the big locomotive boiler of today. It probably has a good deal to do with the annoying and treacherous differences in gauge and water glass indications which come into existence when these large boilers are worked at high rates of evaporation. And possibly faulty or limited circulation may have a good deal to do with the varying quality of the steam at the various rates of evaporation, to say nothing about the probable effect of such conditions on the stresses developed in different parts of the boiler. At all events profit is bound to follow a thorough investigation of this subject.

Stress Distribution Throughout the Structure of the Locomotive.—A field of technical study almost entirely untouched is that of the distribution of stresses throughout the structure of the locomotive, as determined experimentally. The mathematical and empirical formulas of the designers based on different kinds of assumptions, can be checked experimentally in a very reliable and thorough manner, with the result, no doubt, that many sources of failure in structure under service conditions can be remedied.

Similarly the question of stresses developed in frames, firebox sheets and other parts of the locomotive by various methods of welding, i.e., thermit, oil, oxy-acetylene, and electric, should be investigated. An entirely new light would

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be thrown on the relative merits of these repair processes to say nothing about learning more concerning improved ways for applying them.

Heat Treated and Alloy Steels.—The use of heat treated and alloy steels in locomotive construction deserves a great deal of investigation. The real possibilities along this line will only be appreciated when the use of special steels in the development of the airplane motor is considered. There is, of course, a vast difference between the airplane motor and the steam locomotive, but the one thing that has made the very light, high powered aeromotor possible has been the ingenious use of alloy and heat treated steels. No better object lesson of the possibilities of systematic experimentation in engineering exists to-day than the development of the airplane and its motor. There is no reason why equally gratifying results could not be obtained by a similar intensive application of this method to the locomotive.

GENERAL PERFORMANCE

Considered in its broadest aspect, the locomotive is a combination of materials of engineering which, when operated as a unit will perform more or less economically, exactly in accordance with the ingenuity displayed in selecting, distributing and proportioning these materials. The ultimate purpose of making the many investigations already mentioned is to secure additional data and experience in order to enable the designer, builder and operator of the locomotive to improve its performance in specific directions. But it is also important to know what the sum totals of all these improvements amount to, and compare these totals with other totals so as to effect an intelligent and accurate evaluation of these improvements. Such information is secured by what may be called general performance tests.

Just as with locomotive boilers, so with the locomotive as a whole, but too few overall or general performance tests are available for close performance studies and comparisons of various types. What constitutes the data necessary to determine the entire performance and economy of the locomotive has been standardized to a certain extent by the American Railway Master Mechanics' Association and the American Society of Mechanical Engineers. It is not out of place here to say that this work of code standardization might well continue, especially with the idea in view of establishing as standard at least some of the principal locomotive performance curves, which might be termed, as in the test nomenclature of electrical machinery, characteristic curves. The gradual accumulation of such curves from different locomotives would serve as an increasingly valuable fund of information for all those interested in the development of the locomotive.

Over-All Tests on Locomotives Purchased to Specification.—It is an astonishing situation that the railway industry has not long ago established the practice of calling for certain guaranteed economical performances of new locomotives or even locomotive devices and of running a series of performance or acceptance tests to see whether or not these guarantees have been met. This is a custom pursued by industrial engineers, by marine engineers, and by a large group of other purchasers of machinery and equipment. This situation is increasingly difficult to understand when the initial expenditure as well as the subsequent operating costs of a consignment of new locomotives are compared with the erection and operation of a new power house. No alert industrial engineer would undertake the installation of a steam or hydro-electric power plant without first specifying the limits for performance costs and then, after the plant had been placed in operation, running a complete performance test to check the guarantees. There is no reason why the same system can not be adopted for the steam locomotive. Out of a lot built to certain specifications and guarantees, one might easily be taken and subjected to a complete laboratory performance test, and its entire economy accurately determined. Such a test would be relatively insignificant in cost, including all overhead charges, when compared to similar tests made on power plants, warships, or merchant ships, and when compared with the cost of the locomotives in one order. Indeed, such a test would hardly add $50 to the cost of one locomotive of a consignment of one hundred, which would be about 1/10 of 1 per cent of the price of modern locomotives. The incidental modifications and adjustments suggested by the experiment for not only the one locomotive tested, but of all the others secured on the same order would more than justify the expense of the test.

Modernizing Devices.—What has just been stated concerning the locomotive as a whole applies quite as well to such specific parts as the so-called modernizing devices. The lengths to which it is advisable to go in the application of any one or of any combination of these devices depends almost entirely upon the net economies which will be effected by their introduction. The exact effect on operating costs by partially or entirely altering and modernizing old locomotives should be determined by complete performance tests rather than by some of the dubious methods now used.

Determination of Locomotive Characteristics for Use in Scientific Train Loading and Operation.—Complete locomotive performance records as determined from the laboratory tests for securing the objects indicated above, as well as similar tests on other important types of locomotives already in service might well be employed in connection with the establishment of a much more scientific and economically reliable train loading and scheduling system than is now in use. In addition to our present knowledge of the characteristics of train resistance, labor costs, profile, etc., we would also know accurately the drawbar pull and the fuel and water consumption of the locomotive as based on its speed and boiler capacity. The careful application of these characteristics for each class of locomotives in the working out of train schedules and the operating of locomotives and trains in conformance therewith, the establishing of definite standards and the rigid checking of locomotive and train crews on water, fuel and time consumption will effect far-reaching economies, and create much more definite standards of operating costs than are now in existence.

CONCLUSION

Such possibilities as just indicated may perhaps appear rather far-fetched. They would, however, follow from the application of the complete scientific data secured by a careful analysis of the performance of the locomotive in the locomotive laboratory.

Other investigations, both laboratory and statistical, also might have been emphasized above. For instance, relatively little is known about the difference in economy between a locomotive just completely overhauled and one which, according to present day standards, is just ready for general repairs. More light on this point, determined from laboratory tests, might have a decided effect on the shopping policy of many railroads. Little reliable knowledge exists as to the comparative maintenance costs, item by item, of the many distinct types and sizes of locomotives now in service. A thorough statistical investigation on this point would be invaluable. The same is true of the life, service and maintenance costs of specific locomotive parts and devices. There are still other problems which could be mentioned, but it will be quite sufficient for the advance of present day locomotive efficiency if work is started and systematically pursued within the next few years on some of the problems.

The railroads of the United States have been fortunate in having extensive facilities for carrying on the investigations indicated above, but they have remained for the most part indifferent to their opportunities. The time is at hand, however, when this attitude must change. They must resort to more scientific methods to solve the problems now being faced.

The United States Standard Cars

Specifications and Principal Drawings of the New Freight Cars to Be Purchased by the Government

On Monday, March 25, the Director General issued the drawings and specifications for the standard cars recently designed by the government's car committee. These specifications cover designs for bodies of a 40-ton steel underframe, double sheathed box car; a 40 and 50-ton steel frame, single sheathed box car; a 50-ton steel high side gondola car; a 50-ton composite high side gondola car; a 70-ton low side steel gondola car with drop ends, a 55-ton hopper car, and a 70-ton hopper car. There are only three designs of trucks for these cars. They are of 40, 50 and 70 tons capacity. The principal drawings of these cars and trucks have been reproduced and are shown in the following pages. In addition to these specifications will be issued for a 50-ton steel box car, a 30-ton refrigerator and a 50-ton general service car. From a study of these drawings in connection with the specifications, it is quite apparent that the government's standardization committee has provided some cars which no railroad need fear to operate.

Every attempt has been made to make as many parts as possible adaptable to more than one design, in order to reduce the number of dies, patterns, etc., the builders must make in constructing the cars. It is noteworthy the amount of pressed steel shapes that have been used in the designs and the small amount of commercial shapes. Where commercial shapes have been used, however, a strenuous attempt has been made to use the same shapes. For instance, the 12-in., 35-lb. channels are used to a large extent for the center sills. The end sills, and in some cases side sills, are made up of 9-in., 17.44-lb. shipbuilding channels. In the open-top cars a 13.2-lb. bulb angle is used on practically all the designs. The draft sill arrangement is identical, with the exception of some details, to all cars, and a standard distance of 12⅞ in. is maintained between the center sills.

General Dimensions of the United States Standard Freight Cars

	40-Ton Double Sheathed Box	40 and 50-Ton Steel Frame Single Sheathed Box	50-Ton Steel Gondola	50-Ton Composite Gondola	70-Ton Steel Gondola	55-Ton Hopper	70-Ton Hopper
Length, inside	40 ft. 6 in.	40 ft. 6 in.	41 ft. 6 in	41 ft. 6 in.	46 ft. 6 in.	30 ft. 6 in.	39 ft. 6 in.
Width, inside	8 ft. 6 in.	8 ft. 6 in.	9 ft. 4⅞ in.	9 ft. 1⅝ in.	9 ft. 6 in.	9 ft. 5½ in.	9 ft. 5½ in.
Height, inside	9 ft. 0 in.	9 ft. 0 in.	4 ft. 8 in.	4 ft. 8 in.	3 ft. 0 in.	......	......
Length over striking plates	42 ft. 1½ in.	42 ft. 1½ in.	42 ft. 10½ in.	42 ft. 10½ in.	48 ft. 7 in.	31 ft. 11 in.	40 ft. 5 in.
Width over eaves	9 ft. 4 in.	9 ft. 4¼ in.	......	......	......	......	......
Width over all	10 ft. 2½ in.	10 ft. 2¼ in.	10 ft. 2⅞ in.	10 ft. 2⅞ in.	10 ft. 3¼ in.	10 ft. 2¾ in.	10 ft. 2¾ in.
Height from rail to top of car at eaves	12 ft. 10⅛ in.	12 ft. 10⅛ in.	......	......	......	......	......
Height from rail to top of car body	......	......	8 ft. ¾ in.	8 ft. 3½ in.	6 ft. 4¾ in.	10 ft. 8 in.	10 ft. 8 in.
Height from rail to top of brake mast	14 ft. 1¾ in.	14 ft. 1¾ in.	8 ft. 7¾ in.	8 ft. 10¼ in.	7 ft. 1⅛ in.	11 ft. 2¼ in.	11 ft. 2¼ in.
Height from rail to top of running board	13 ft. 6⅞ in.	13 ft. 6⅞ in.	......	......	......	......	......
Distance center to center of trucks	31 ft. 1½ in.	31 ft. 1½ in.	31 ft. 10½ in.	31 ft. 10½ in.	37 ft. 7 in.	21 ft. 11 in.	30 ft. 5 in.
Height from rail to center of coupler	2 ft. 10½ in.	2 ft. 10½ in.	2 ft. 10½ in.	2 ft. 10½ in.	2 ft. 10½ in.	2 ft. 10½ in.	2 ft. 10½ in.
Height from rail to bottom of center sill	2 ft. 4½ in.	2 ft. 4½ in.	2 ft. 4½ in.	2 ft. 4½ in.	2 ft. 4½ in.	2 ft. 4½ in.	2 ft. 4½ in.
Cubic capacity—level full	......	......	1,820 cu. ft.	1,770 cu. ft.	......	1,880 cu. ft.	2,508 cu. ft.
Cubic capacity—with 30 deg. heap	......	......	2,310 cu. ft.	2,230 cu. ft.	......	2,235 cu. ft.	2,978 cu. ft.
Estimated weight	44,000 lb.	44,000 lb.	42,000 lb.	40,000 lb.	49,500 lb.	40,000 lb.	49,500 lb.

Car Body Specifications

In addition to this, detail parts have been made of the same designs where it has been possible to do so, among which may be mentioned the body center plate, body side bearing, front draft lug, striking plate, coupler yoke key and cotter, coupler carrying iron and ladder rounds and grab irons. These are common to all of the designs. There are also other parts which are common to more than one design. For instance, one design of body bolster, center brace, rear draft lug and draft sill is used for the 40- and 50-ton single sheathed box cars, the 50-ton steel gondola and the 50-ton composite gondola. The trucks are similar in construction and have a center plate and center plate support common to all three. The limiting dimensions for brake beams is also the same.

The general dimensions of these cars are shown in the table.

The friction type of draft gear has been specified on all cars and the following five types may be used: Cardwell, Murray, Sessions type "K," Westinghouse and Miner. The M. C. B. Type D standard coupler with the 6-in. by 8-in. shank is specified on all cars. M. C. B. specifications have been followed to a large extent and a complete specification for paint is included to be used for all cars. Following is a list of the specifications that are common to the bodies of all of the cars:

Center Sill Requirements.—The center sill construction is designed to meet the M. C. B. requirements, having an area of not less than 24 sq. in. in cross section and a ratio of stress to end load not exceeding .06.

Safety Appliances.—To be applied in accordance with United States safety appliances standard.

Material Options.—Wherever more than one kind of material or construction is shown on drawing or mentioned in specification, it is understood that either may be furnished by the builder unless otherwise specified. Specialties to be as covered in contract.

Bolts and Nuts.—All bolts to have square head and nut unless otherwise specified. All bolts for securing steel against steel to have cotters, lock washers or lock nuts, in addition to common nut, and all bolts for securing wood against steel to be riveted over nuts.

Brakes.—Cars to be equipped with Westinghouse KD-10-12 type (the box cars are to be equipped with the KC-10-12 type) of air brakes of either Westinghouse or New York Air Brake Company's manufacture. Hose and gaskets to meet M. C. B. specifications. Brakes to be applied to all wheels and also arranged to be operated from one end of the car by hand. Braking power to be about 60 per cent of light weight of car based on 50-lb. cylinder pressure. Piston travel to be between 5 and 7 in. Hand brake power to be approximately the same as the air brake power. All piping to be black steel, merchantable, standard weight, and fittings to be malleable iron.

Draft Gear.—To be of the friction type, having a minimum capacity of 150,000 lb. and a maximum travel of 2¾ in., designed so as to fit into the space provided by the drawings. Clearance between coupler horn and striking plate to be 3 in. The following types may be used: Cardwell, Murray, Sessions type "K," Westinghouse, Miner.

Drawbar Yoke.—To be of the vertical plane type of an

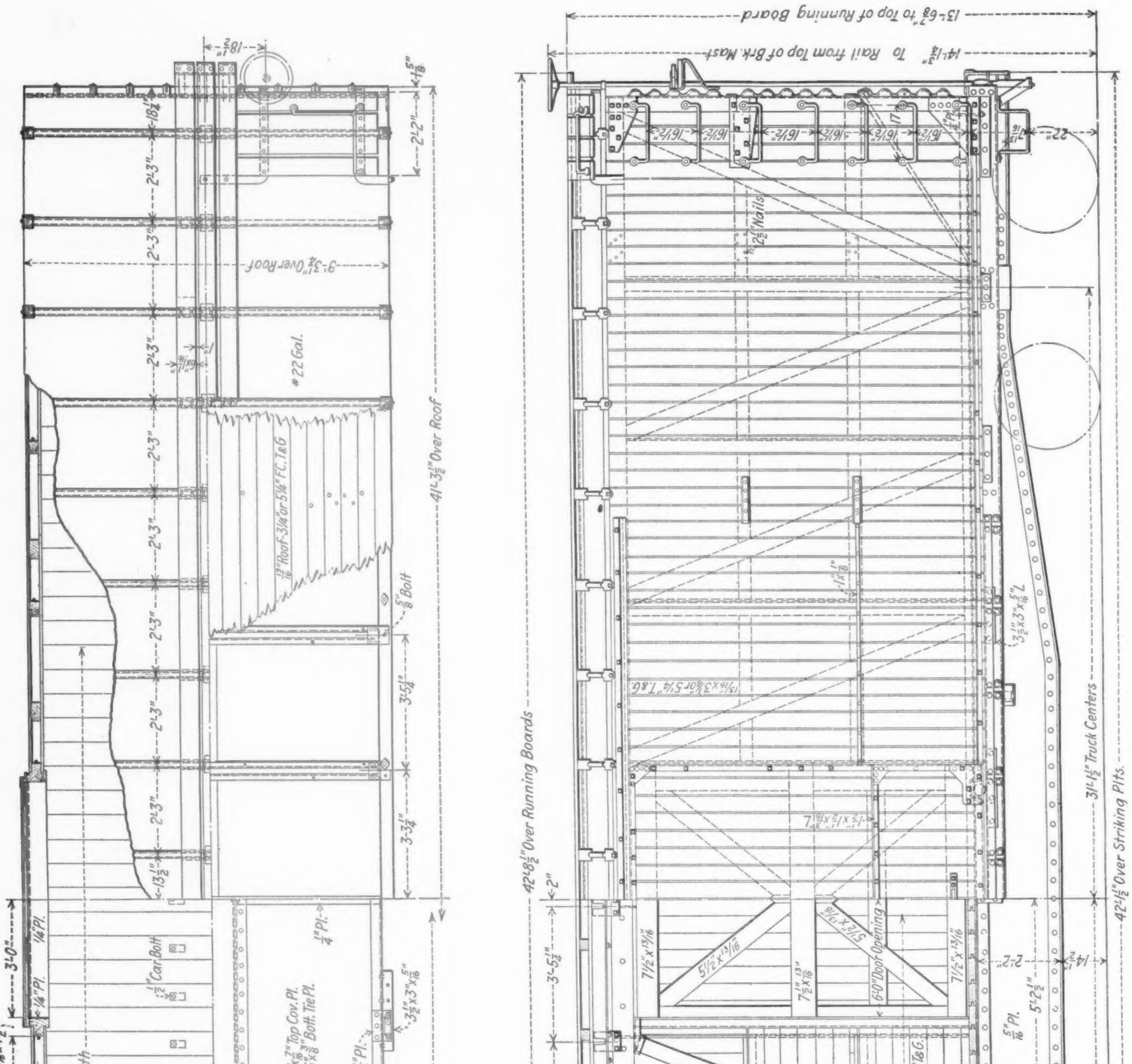

Fig. 1—General Plan for the Standard 40-Ton Double Sheathed Box Car

approved design, arranged to take the key shown on drawing.

Coupler.—To be cast steel, in accordance with M. C. B. contour and specification, having 6-in. by 8-in. shank, 21¼ in. long, as shown on coupler condition drawing, and slotted tail of proper depth to suit draft gear.

Coupler Operating Device.—To be of the top operating type without the use of clevises, links and pins; that is, to be direct connected to the locking block. Apparatus to be in accordance with condition drawings.

Center Plate.—To be, first, drop forged, or second, cast steel.

Side Bearing.—To be, first, frictionless, or second, plain. Frictionless side bearings to be of approved type to meet conditions shown on drawing. Drawings are arranged so that plain side bearing can be used in repairs.

Material Specifications.—The following M. C. B. specifications for materials are to apply.

Air brake hose.	Mild steel bars.
Air brake hose gaskets.	Steel castings.
Air brake hose label.	Pipe unions.
Boiled linseed oil.	Raw linseed oil.
Bolts and nuts.	Red lead.
Carbon steel bars for railway springs.	Rivet steel and rivets.
Chains.	Structural steel, steel plate and steel sheets for freight equipment cars.
Couplers.	Turpentine.
Helical springs.	Welded pipe.
Japan drier.	White lead for lettering.
Malleable iron castings.	Wrought iron bars.

FREIGHT CAR PAINT SPECIFICATIONS

For Use on All Cars

Freight Car Color. I. This material will be bought in the paste form, and the paste must contain nothing but oil, pigment and moisture.

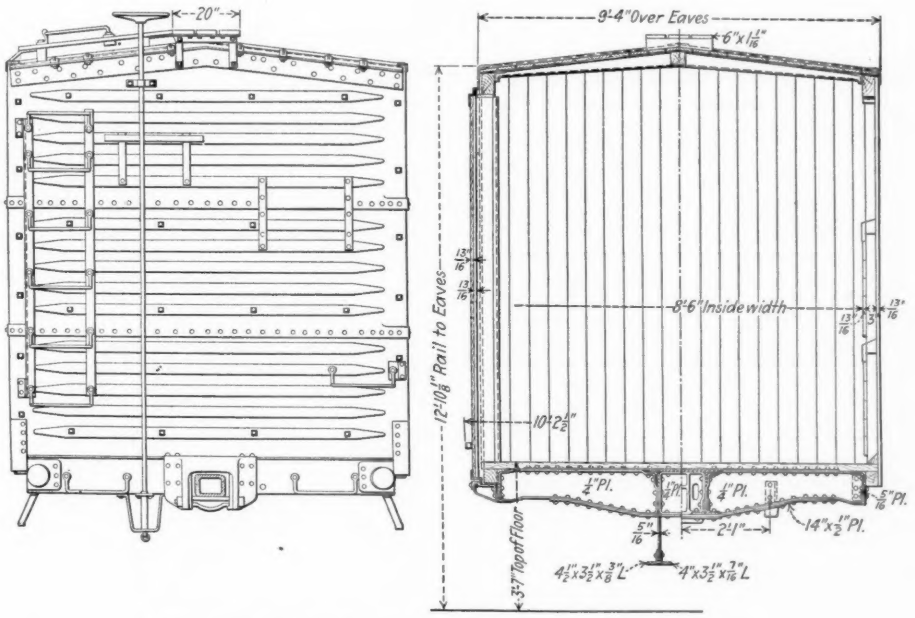

Fig. 2—Sections of the 40-Ton Double Sheathed Box Car

II. The proportions of oil, pigment and moisture must be as nearly as possible as follows:

Pigment	74 per cent by weight
Oil	25 per cent by weight
Moisture	1 per cent by weight

III. The oil must be pure raw linseed oil, as free as possible from foots, and well clarified by settling and age.

IV. The pigment desired if it contains sulphate of lime or gypsum should have this fully hydrated. It may have as inert material sulphate of lime of gypsum fully hydrated, silica, kaolin, soapstone or asbestine, or mixtures of any of these, sulphate of lime and silica preferred. The pigment should have the following composition:

Sesquioxide of iron	25 per cent by weight
Inert material	71½ per cent by weight
Carbonate of lime	3½ per cent by weight

V. Material must conform to shade furnished and in fineness of grinding meet test in accordance with approved method of Standard Railway laboratories.

VI. Shipments will not be accepted which:

1. Contain less than 23 per cent or more than 27 per cent of oil.
2. Contain more than 2 per cent volatile matter, including the moisture, the oil being dried to 250 degrees Fahrenheit, and the pigment dried in air which has been passed through oil of vitriol, at from 60 degrees to 90 degrees Fahrenheit.
3. Contain impure or boiled linseed oil.
4. Contain in the pigment sulphate of lime not fully hydrated, less than 20 per cent of sesquioxide of iron, less than 2 per cent or more than 5 per cent of carbonates, calculated as carbonate of lime, or have present any barytes, carbonates of alkalis, aniline colors, lakes or any other organic coloring matter, or any soaps or other emulsifying material.
5. Vary from shade.
6. Do not pass fineness of test.
7. Are a liver or so stiff when received that they will not readily mix for spreading.

Carbon Black. I. This material must be furnished in paste form.

II. The material desired under this specification is a paste, made on the following formula:

Pigment	65 per cent by weight
Oil	35 per cent by weight

The oil must be pure raw linseed oil, as free as possible from foots, and well clarified by settling and age.

The pigment desired should consist of:

Lampblack, of carbon black	15 per cent
Red lead	5 per cent
Asbestine	10 per cent
Silex or other approved material	70 per cent

The lampblack must be of good quality, and of such a character as to produce the standard shade. Ground coal, etc., will not be considered. Phosphates, barytes, sulphates of lime or gypsum, carbonate of lime or whiting or any other carbonates or sulphates, or any constituents other than

those given in the composition of the pigment desired, must not be used.

III. Material must conform to shade furnished and in

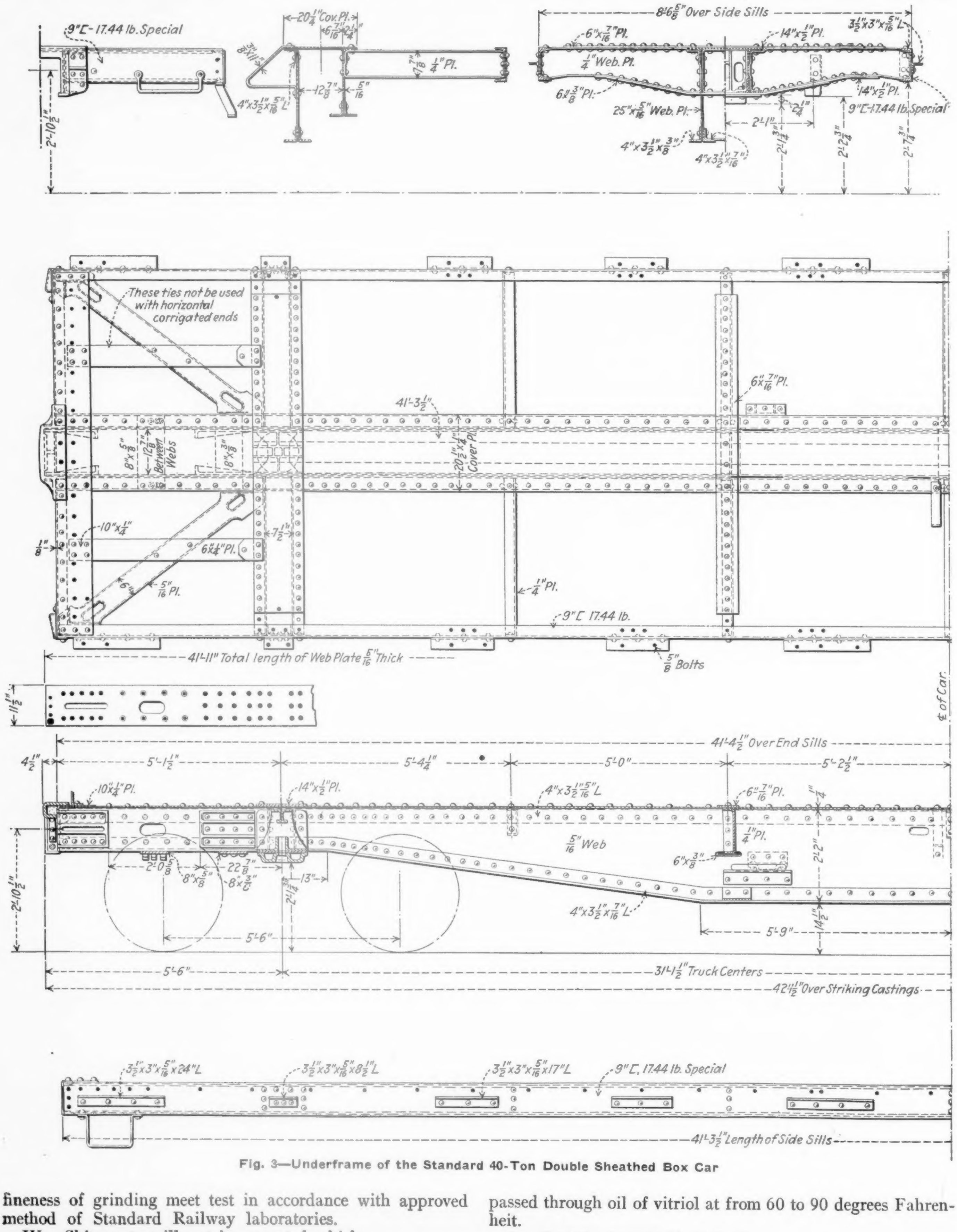

Fig. 3—Underframe of the Standard 40-Ton Double Sheathed Box Car

fineness of grinding meet test in accordance with approved method of Standard Railway laboratories.

IV. Shipments will not be accepted which:

1. Contain less than 32 or more than 38 per cent oil.

2. Contain more than 2 per cent of volatile matter, including the moisture, the oil being dried at 250 degrees Fahrenheit, and the pigment dried in air which has been passed through oil of vitriol at from 60 to 90 degrees Fahrenheit.

3. Contain impure linseed oil.

4. Contain in the pigment less than 13 per cent or more

than 16 per cent carbon, preferably in the form of lampblack or carbon black, less than 4 per cent of lead representing the red lead, or have present any phosphates, barytes, sulphate of lime or gypsum, carbonate of lime or whiting, or any other sulphates or carbonates or any other caustic substances, such as caustic lime, or any soaps or other emulsifying materials, or any constituents other than those given in the formula for the pigment desired.

5. Do not pass fineness test.

6. Do not contain asbestine according to the formula of the pigment desired.

7. Are a liver, or so stiff when received that they will not readily mix for spreading.

Red Lead. This paint shall be furnished in prepared form ready for application. It shall contain not less than 64 per cent or more than 68 per cent of pigment. The pigment portion of the paint shall contain 60 per cent red lead. The red lead used shall contain not less than 85 per cent Pb_3O_4. The balance of the pigment portion of the paint shall consist of silicious matter such as magnesium or aluminum silicate or silica or a mixture thereof.

The vehicle shall consist of not less than 90 per cent linseed oil, the balance to be liquid drier and volatile thinner. The volatile thinner may be turpentine or mineral spirits or a mixture of the two. No rosin shall be present in the vehicle.

The prepared paint as received must have satisfactory working qualities and durability. It must be free from objectionable caking in the can. When applied to a smooth iron surface it must dry in twelve hours without running, streaking or sagging.

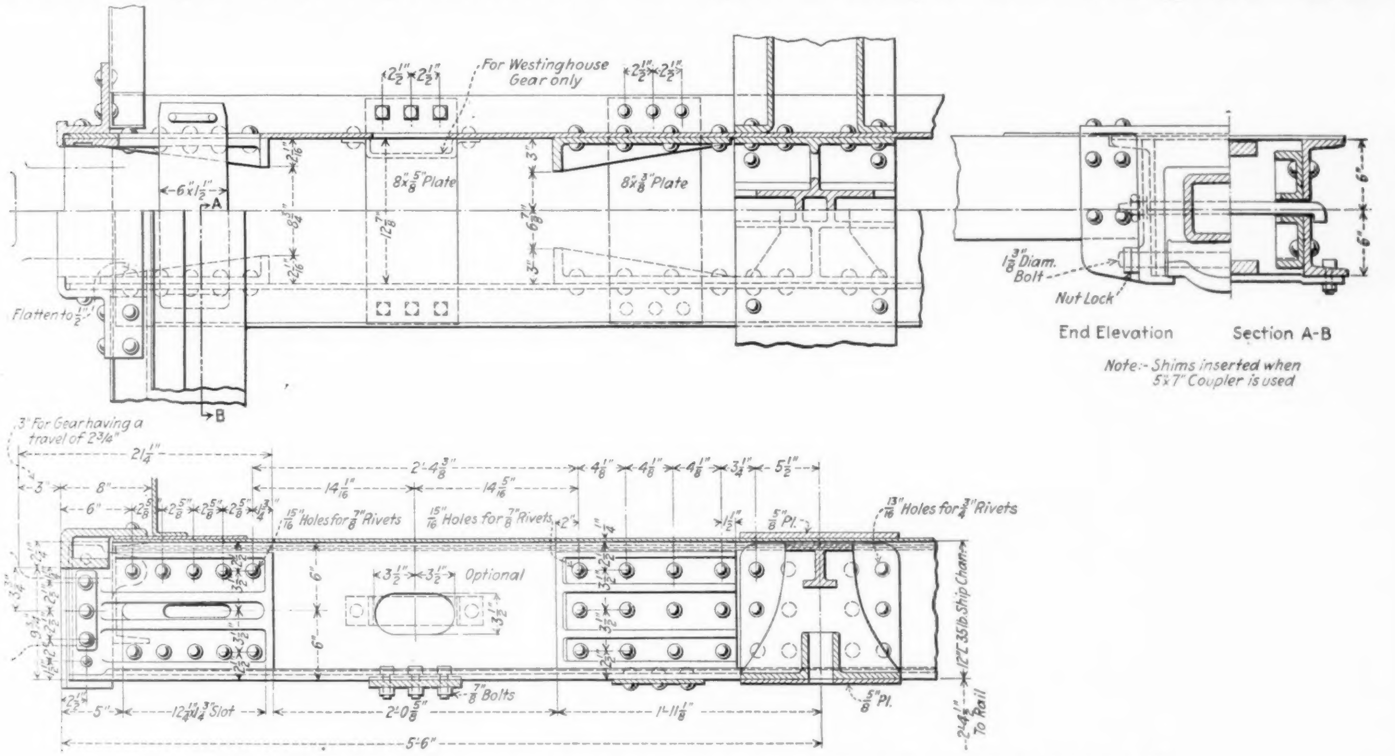

Fig. 4—Draft Sill Construction for the Box and the 50-Ton Steel and Composite Gondola Cars

BOX CARS

All designs of the box cars have a steel underframe and steel ends. The bodies of the 40- and 50-ton single sheathed box cars are identical; the only difference is in the trucks. The specifications peculiar to the box cars and similar to all of the box car designs are as follows:

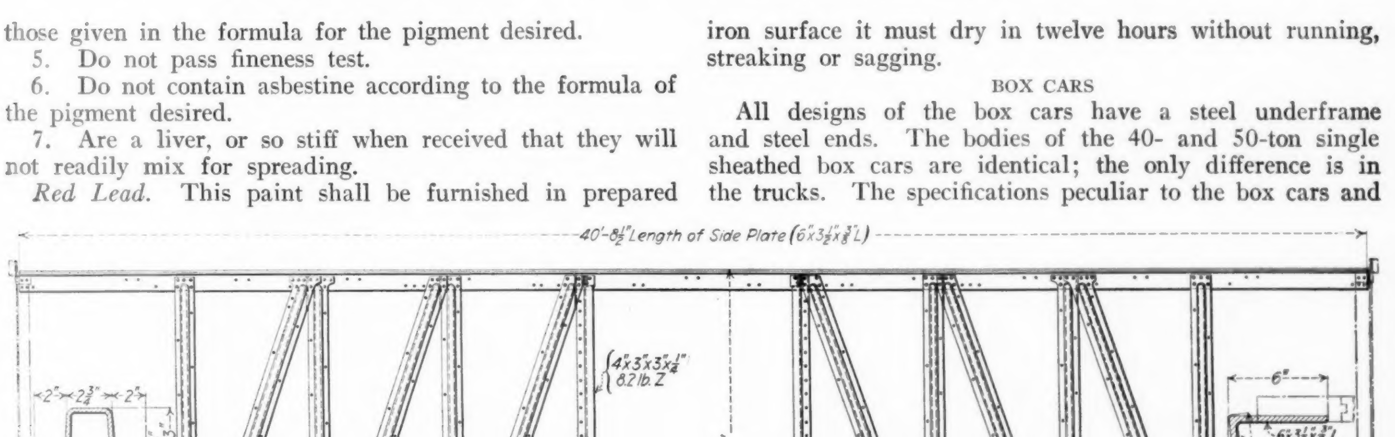

Fig. 5—Side Construction for the Standard Single Sheathed Box Cars

Flooring.—To be of fir or long leaf yellow pine, square edge and sound, 2¼ in. thick, tongued and grooved, 5¼-in. to 7¼-in. face width, secured to side and center sills, as shown on drawing.

End Lining.—To be yellow pine, No. 1 common, or fir 1½ in. thick, tongued and grooved, 5-in. face width.

Roof.—To be galvanized steel No. 22 gage, outside metal

roof, laid over yellow pine roof boards, No. 1 common, or fir 13-16 in. thick by 3¼-in. or 5¼-in. face width as shown on drawing No. 1337. (The drawings state that the Murphy, Hutchins, or Chicago-Cleveland outside roofs may be used if they interchange with the designs shown.)

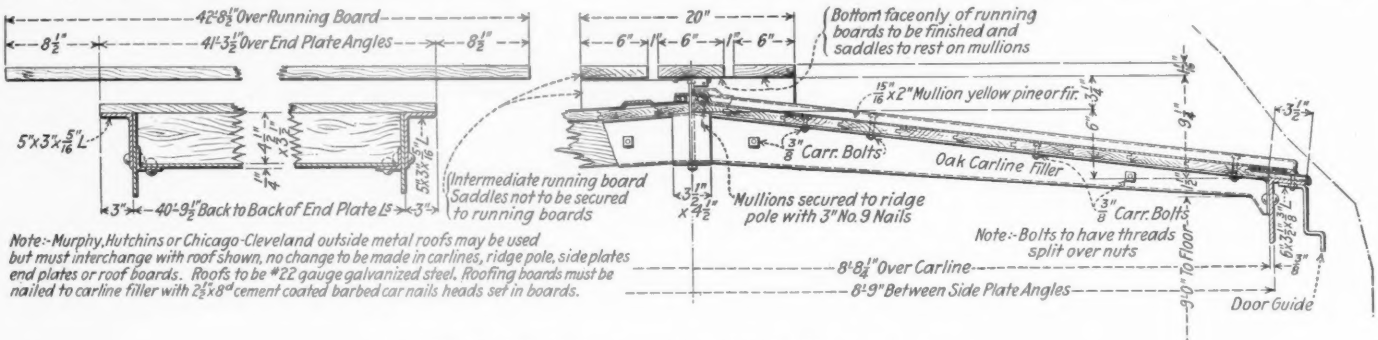

Fig. 6—Roof Construction for the Standard Box Cars

and grooved, 3¼-in. or 5¼-in. face width, securing to framing as shown on drawings.

Side Lining.—To be yellow pine, No. 1 common, or fir 13/16 in. thick, tongued and grooved, 3¼-in. or 5¼-in. face width, secured to framing, as shown on the drawings.

Steel Ends.—First, horizontal corrugated of three sheets; top sheet 3-16 in. thick, intermediate and bottom sheets ¼ in. thick with corrugations 2¼ in. deep. Second, vertical corrugated of two sheets, all ¼ in. thick with corrugations 2¼ in. deep. Third—Plain steel end with U-shape vertical stakes, as shown on drawings.

The side lining for the 40- and 50-ton steel frame, single sheathed box cars is to be of, first, fir No. 2 clear and better, or second, yellow pine B and better. Lumber is to be thoroughly kiln dried, having maximum moisture of 5 per cent, tongued and grooved and with a 5-in. face.

The designs are illustrated in Figs. 1 to 10 inclusive.

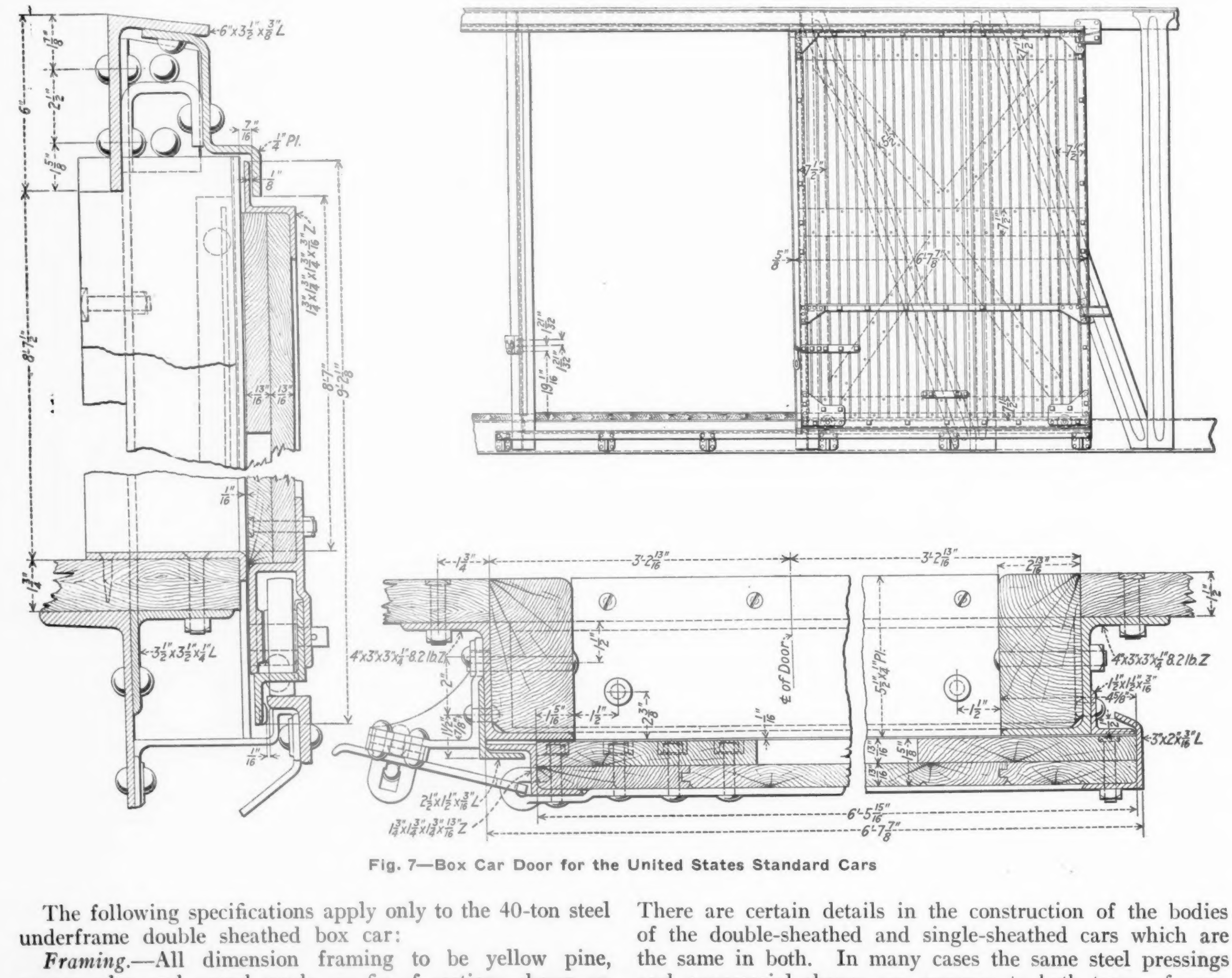

Fig. 7—Box Car Door for the United States Standard Cars

The following specifications apply only to the 40-ton steel underframe double sheathed box car:

Framing.—All dimension framing to be yellow pine, square edge and sound grade, or fir of sections shown on drawings.

Side Sheathing.—To be long leaf yellow pine, B and better, or No. 2 clear and better fir 13/16 in. thick, tongued and grooved, 3¼-in. or 5¼-in. face width, securing to framing as shown on drawings.

There are certain details in the construction of the bodies of the double-sheathed and single-sheathed cars which are the same in both. In many cases the same steel pressings and commercial shapes are common to both types of cars. A brief description of the construction of these cars follows:

Forty-Ton Double Sheathed Box Car.—This design has an estimated weight of 44,000 lb. The general plan of this

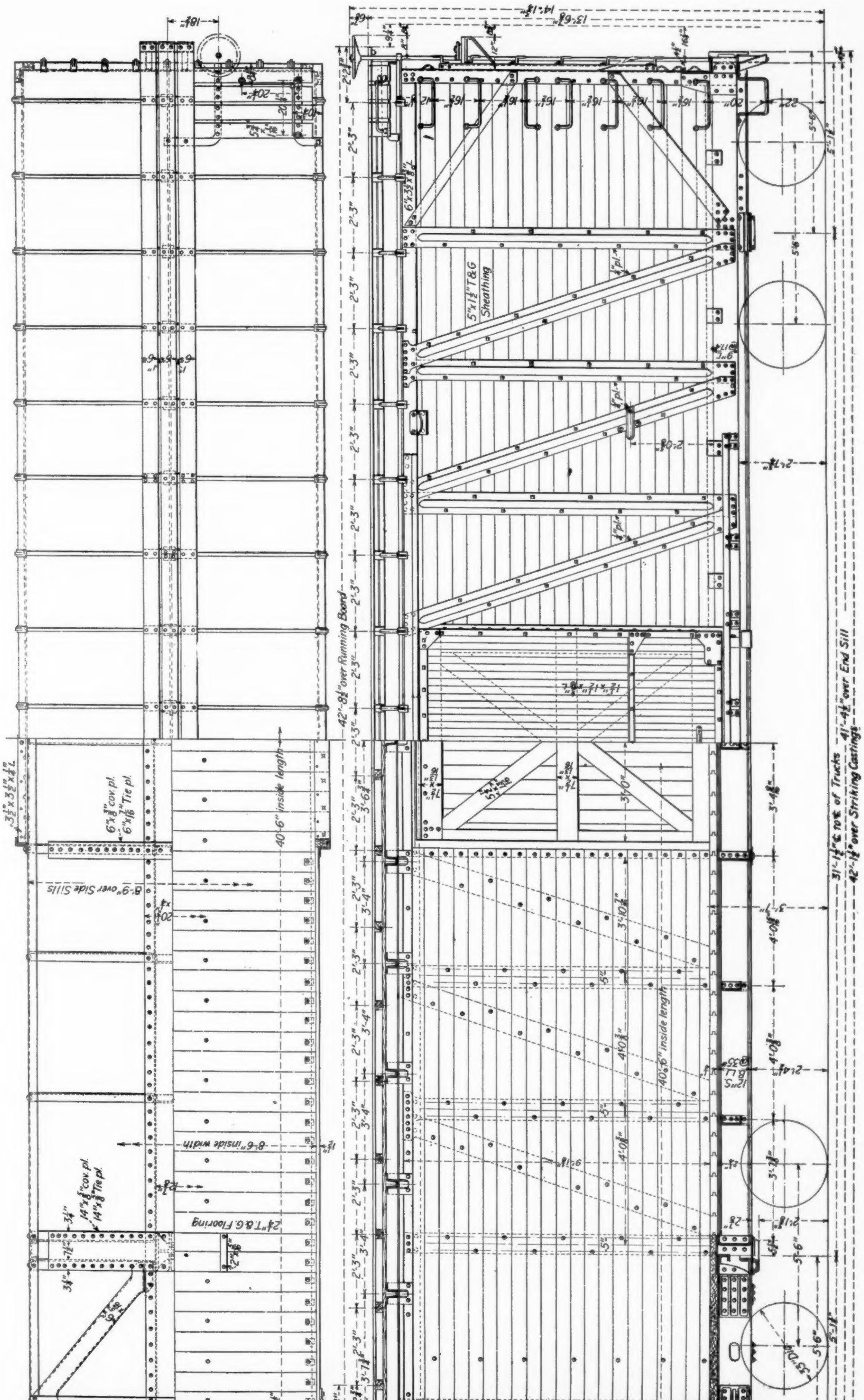

Fig. 8—General Plan for the Standard 40- and 50-Ton Steel Frame, Single Sheathed Box Car

car is shown in Figs. 1 and 2 and the underframe is shown in Fig. 3. The underframe has a center sill of the fish-belly type, which is 2 ft. 2 in. deep at the center. It is made up of 5/16-in. web plates, with a top 4-in. by 3½-in. by 5/16-in. angle and a bottom 4-in. by 3½-in. by ⅜-in. angle on the outside and a 4-in. by 3½-in. by 7/16-in. angle on the inside of the web plate. There is a top cover plate 20½ in. wide by ¼ in. thick. The draft sills are shown in Fig. 4. There are two crossbearers made up of ¼-in. pressed steel diaphragms, having a top cover plate 6 in. by 7/16 in. and a bottom cover plate which extends through the webs of the sills, of 6-in. by ⅜-in. plate. The body bolsters are built up of ¼-in. pressed steel diaphragms and have top and bottom cover plates 14 in. by ½ in., which extend almost out to the side sills. The side and end sills are 9-in. shipbuilding channels, which are used so commonly throughout the design of these cars. The end sills are made from the standard 9-in. shipbuilding channels. There is a diagonal brace extending from the junction of the center sill with the body bolster to the corners made of 5/16-in. plate. A 6-in. by ¼-in. plate extends between the body bolsters and the end sill midway between the center sills and the side sills to further reinforce the ends. These are riveted to the diagonal brace mentioned above.

The superstructure of the car is of standard double sheathed construction, with 3½-in. by 3-in. posts and 5-in. by 3-in. braces. The side construction is shown in Fig. 5. The side posts are reinforced by the 3-in. 4-lb. channel, which fits over the post, being bolted to it, and by a ⅝-in. tie rod which extends between the side plate and the side sill. The last intermediate side post is tied to the corner post by ⅝-in. rods at the upper belt rail. The brace and side post pocket casting of the same post is tied to the end of the car by a diagonal tie rod 1⅛ in. in diameter. The side plates are 6¾ in. by 3½ in. A section through the roof is shown in Fig. 6.

The doors are shown in Fig. 7. They are made up of 7½-in. by 13/16-in. transverse and vertical framing, with 5½-in. by 13/16-in. diagonal braces. They are of the underhung type. A 1½-in. by 1½-in. by 13/16-in. angle is placed on the outside for additional stiffness.

Forty and Fifty-Ton Single Sheathed Box Cars.—These cars will weigh 44,000 lb., the same as the other box car. The general plan and sections of this car are shown in Figs. 8 and 9 and the underframe is shown in Fig. 10. In common with the double sheathed car, they have the underhung door and the same draft sills. The center sills are 12-in. ship-building channels. These cars have two crossbearers made up of ¼-in. pressed steel diaphragms with a 6-in. by ⅜-in. top cover plate and a 6-in. by 7/16-in. bottom cover plate. The bolsters are made up of 15/16-in. pressed steel diaphragms with a 14-in. by ⅝-in. top and bottom cover plate. The side sills and end sills are 9-in. shipbuilding channels.

The side posts and braces are of pressed steel U-sections, made from ¼-in. plate. These are riveted to the side sill and to a 6-in. by 3½-in. by ⅜-in. angle, which forms the side plate. The sheathing used for these cars is 5-in. wide by 1½ in. thick. The roof construction is the same in general as that of the double sheathed car. The carlines are made of 5/32-in. open hearth steel pressed to a U-shape, 4½ in. deep.

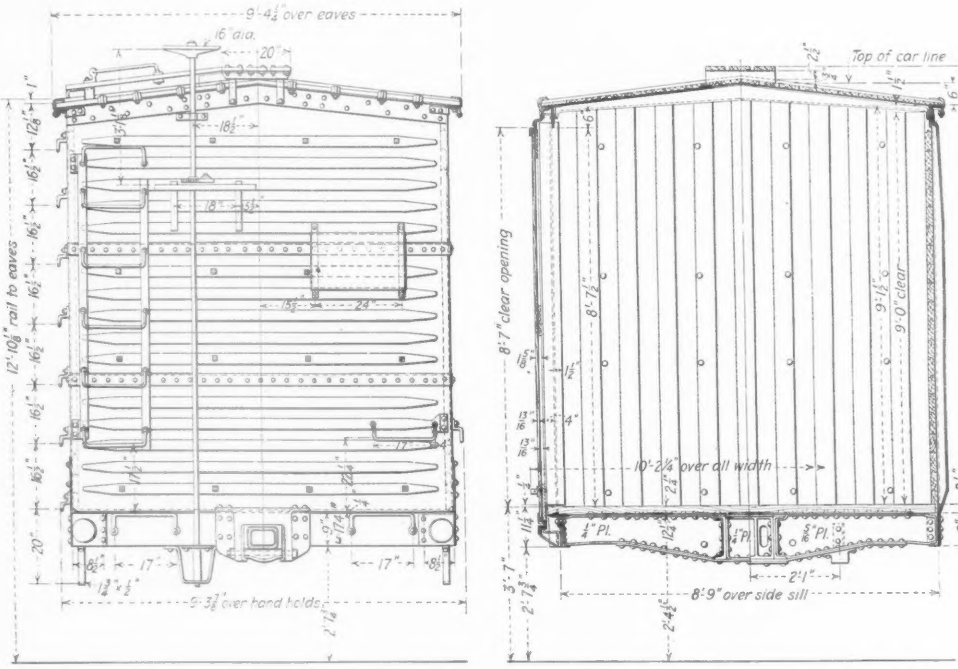

Fig. 9—Sections of the 40- and 50-Ton Single Sheathed Box Car

GONDOLA CARS

The gondola cars are designed to carry a concentrated load of two-thirds of the capacity of the car over a distance of 10 ft. at the center. Eight doors are provided on the 50-ton all-steel and composite high side cars. Those on the all-steel car are hinged cross-wise of the car, while those on the composite car are hinged along the center sill to dump toward the side. In both cases the doors are operated in pairs. The flooring for the composite cars is to be of long leaf yellow pine or fir, 2¾ in. thick, having a face of 5¼ in. to 7¼ in. The siding for these cars is of long leaf yellow pine or fir and 1¾ in. thick.

The underframe on all three of these designs is not the same in its entirety. There are, however, details which are similar. For instance, the draft sill construction and the body bolster center brace of both the 50-ton gondolas are the same as those used on the single sheathed box cars. The body bolster center brace and the rear of draft lug on the 70-ton gondolas are the same as those used on the 40-ton double sheathed box car. There are similarly other details which are common to the various designs.

The drawings for the gondola cars are shown in Figs. 11, 12, 13, 14 and 15. There is a marked similarity

in the general dimensions between the 50-ton steel and composite cars.

Fifty-Ton Composite Gondola.—This car has an estimated weight of 40,000 lb. It has eight drop doors swinging from the center sill, the general plan being shown in Fig. 11.

The underframe, shown in Fig. 12, in common with the other designs is made up of a number of steel pressings. The center sills are 12-in. channels, having a standard distance of 12⅞ in. between the webs and a top cover plate 20½ in. by 1¼ in. There are four crossbearers of the fish-belly type, made up of ¼-in. pressed steel diaphragms, having top and bottom cover plates of 8-in. by ⅜-in. material. The side sills

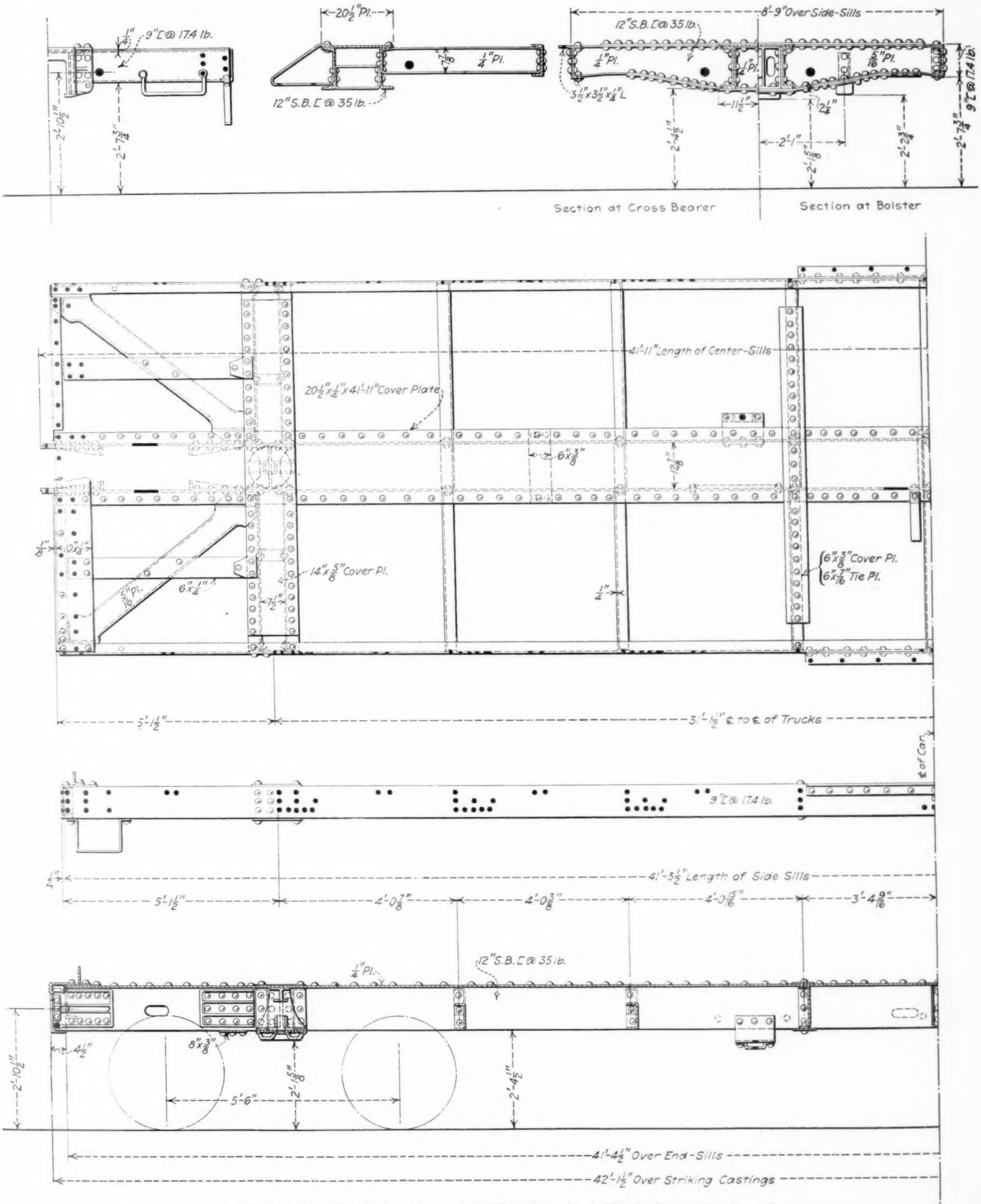

Fig. 10—Underframe of the 40- and 50-Ton Standard Single Sheathed Box Car

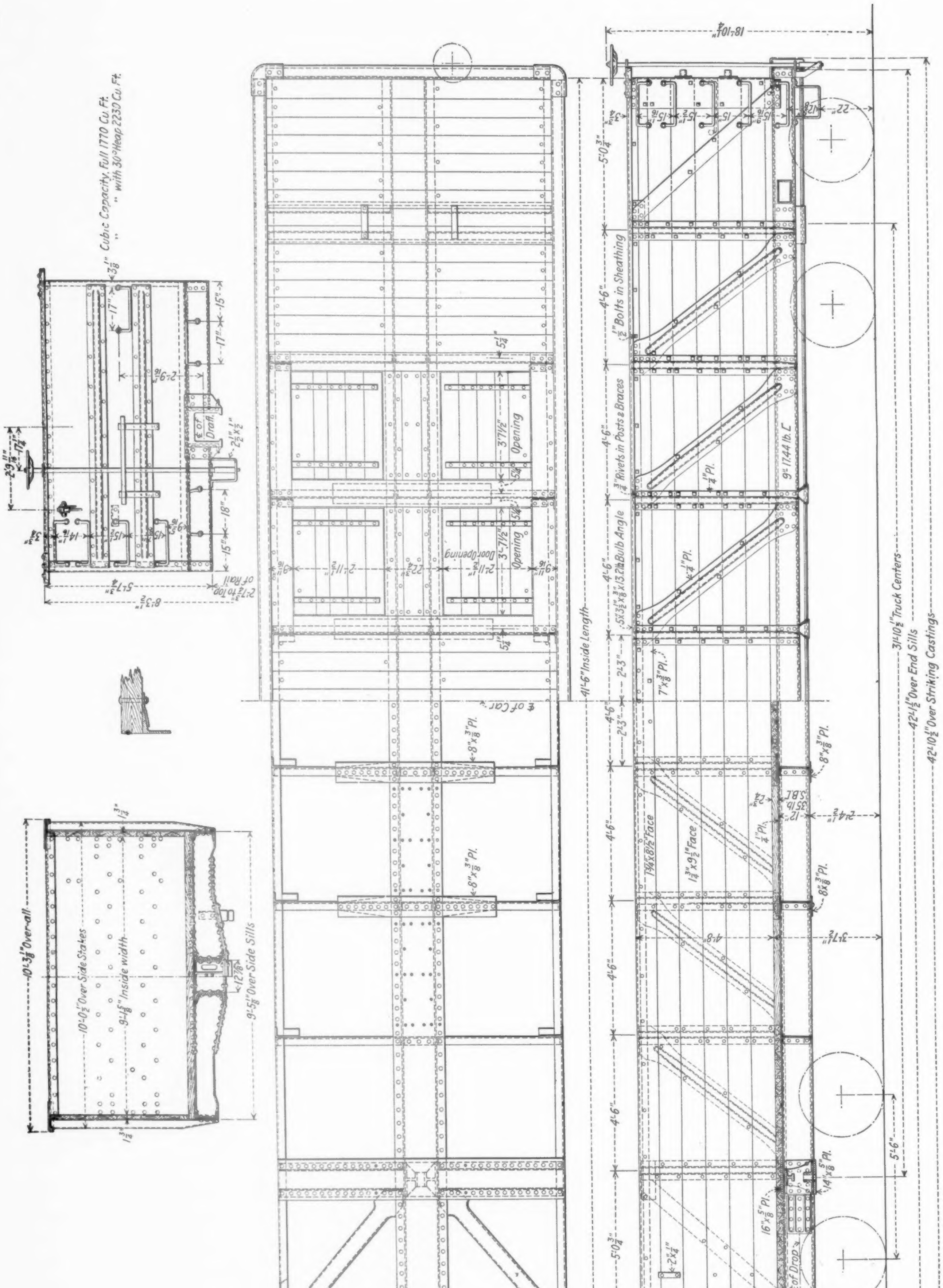

Fig. 11—General Plan of the Standard 50-Ton Composite Gondola Car

are 9-in., 17.44-lb. shipbuilding channels. The body bolsters are built up of steel diaphragms made from 5/16-in. steel plate, having top and bottom cover plates of 5/8-in. steel. The end sills are 9-in., 17.44-lb. ship channels.

The body of the car has eight U-shaped pressed steel stakes on each side and six braces of the same material. These are made from 1/4-in. plates and are 7 1/4 in. wide and 3 1/2 in. deep. The end braces are also pressed from a steel plate in U-sections, being 7 1/4 in. wide, 4 in. deep and 1/4 in. thick. There is a 5-in. by 3 1/2-in. by 3/8-in., 13.2 lb. bulb angle, cover plates 3/8 in. thick and 5 ft. 8 1/2 in. long, with no top cover plate. The side construction consists of 3 1/2-in. by 3-in. by 1/2-in. angles and side stakes of the same dimensions as those used in the composite car, but made from 5/16-in. plate. The end braces and the end sills are the same as used in the composite car. Both the floor and side plates for this car are 1/4-in. sheets, and the same bulb angle is used at the top of the sides as on the composite car.

Seventy-Ton Steel Gondola.—This design has an estimated weight of 49,500 lb. It is to be built entirely of steel

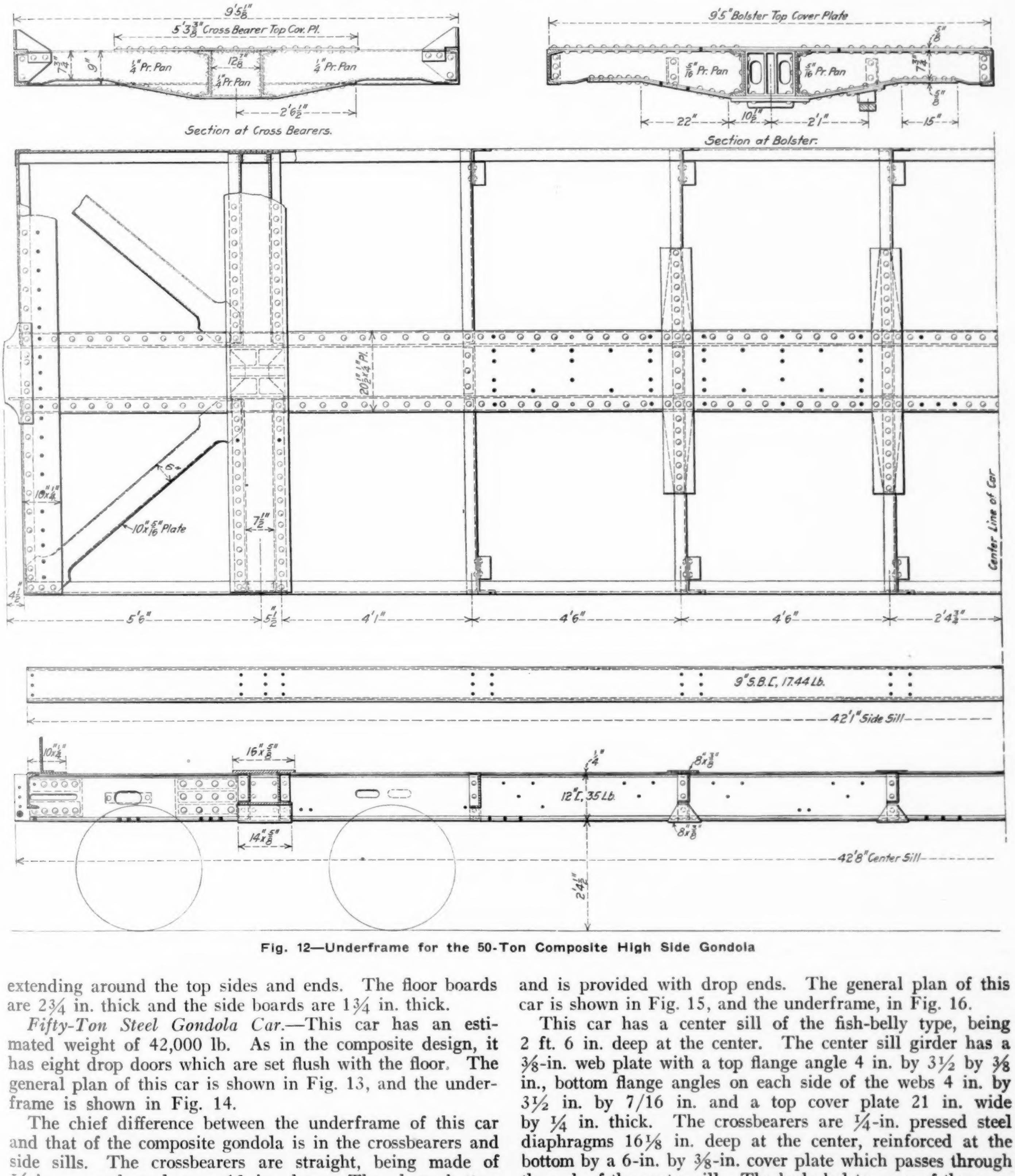

Fig. 12—Underframe for the 50-Ton Composite High Side Gondola

extending around the top sides and ends. The floor boards are 2 3/4 in. thick and the side boards are 1 3/4 in. thick.

Fifty-Ton Steel Gondola Car.—This car has an estimated weight of 42,000 lb. As in the composite design, it has eight drop doors which are set flush with the floor. The general plan of this car is shown in Fig. 13, and the underframe is shown in Fig. 14.

The chief difference between the underframe of this car and that of the composite gondola is in the crossbearers and side sills. The crossbearers are straight, being made of 1/4-in. pressed steel pans 12 in. deep. They have bottom and is provided with drop ends. The general plan of this car is shown in Fig. 15, and the underframe, in Fig. 16.

This car has a center sill of the fish-belly type, being 2 ft. 6 in. deep at the center. The center sill girder has a 3/8-in. web plate with a top flange angle 4 in. by 3 1/2 by 3/8 in., bottom flange angles on each side of the webs 4 in. by 3 1/2 in. by 7/16 in. and a top cover plate 21 in. wide by 1/4 in. thick. The crossbearers are 1/4-in. pressed steel diaphragms 16 1/8 in. deep at the center, reinforced at the bottom by a 6-in. by 3/8-in. cover plate which passes through the web of the center sill. The body bolsters are of the same

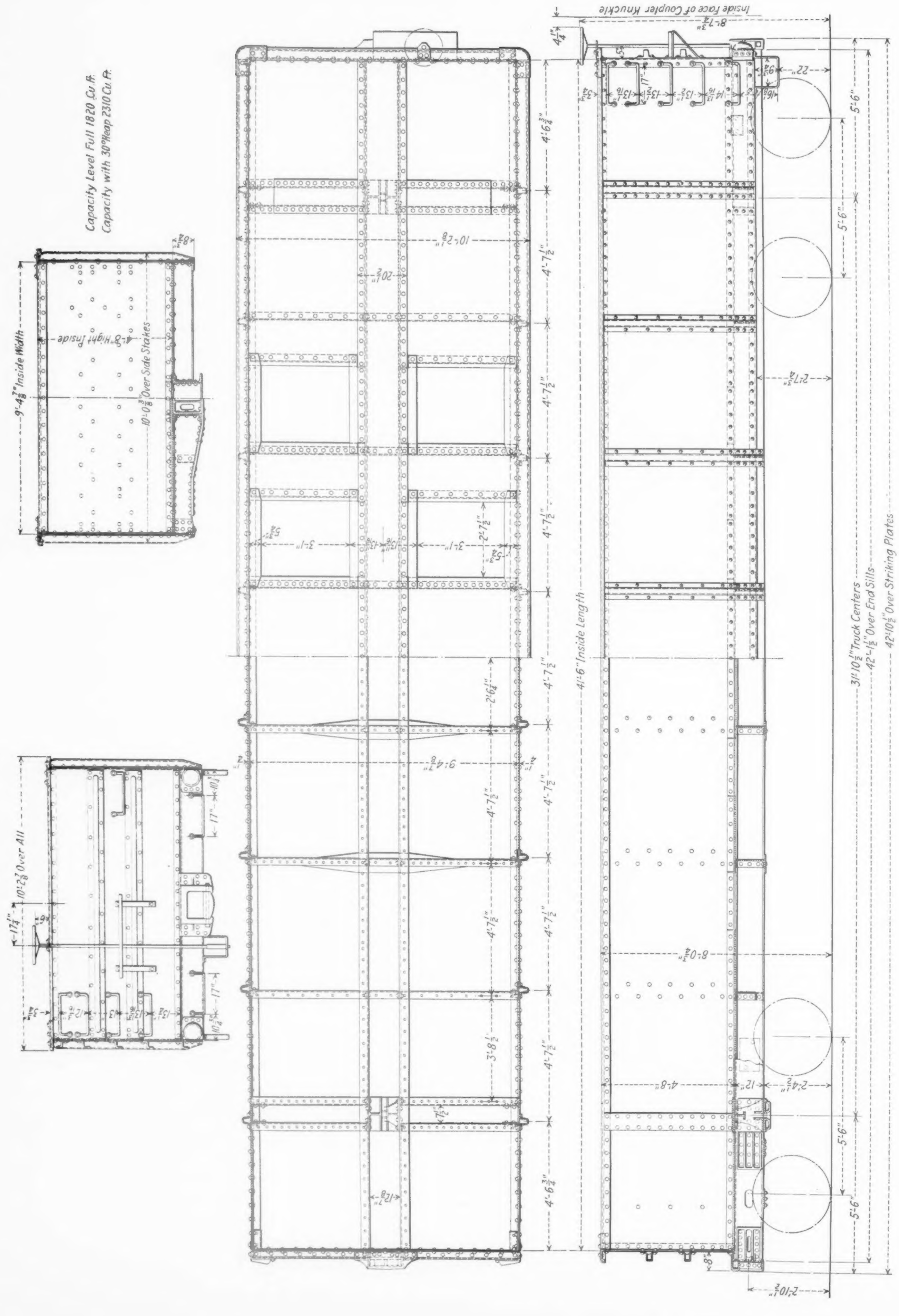

Fig. 13—General Plan of the Standard 50-Ton Steel Gondola Car

general construction as those used on the other gondola cars, having ⅝-in. top and bottom cover plates. The bottom side angle used in this design is 4 in. by 3½ in. by ½ in., and the same bulb angle is used at the top of the sides. The side, end and door sheets of the car are ¼ in. thick. There are 24 pressed steel stakes made from 5/16-in. plate.

HOPPER CARS

The hopper cars are of all-steel construction, the 55-ton car having double hoppers and the 70-ton, triple hoppers. The four doors forming the center opening in the 70-ton car are operated by one mechanism and in all other cases the doors forming the openings are operated in pairs. These cars have the same end and draft sill and have the same design of rear draft lug. There are many details in the door opening mechanism which are common to both types of cars. The floor construction is the same and the hopper construction with the details is common to both. The side hopper sheets are the same.

The elevation and sections of the 55-ton car are shown in Fig. 17, and those for the 70-ton car in Figs. 18 and 19.

Fifty-five-Ton Hopper.—This car has an estimated weight of 40,000 lb. It has the 12-in. channel center sills, which are reinforced at the ends by a 4-in. by 3½-in. by ⅜-in. angle. The center sills cover plate is 12½ in. wide by 15/16 in. thick. The body bolster is built up of a 5/16-in. plate, with reinforcing plates ⅜-in. thick and bottom angles 3½-in. by 3½-in. by ⅜-in. There is a bottom cover plate 14 in. wide of ½-in. plate. The end sills are 9-in. ship-building channels. The standard 5-in. bulb angle is used at the top of the sides and ends. There are 12 side stakes of U-section pressed from ¼-in. plate. The side, end and floor plates are ¼ in. thick, with the exception of the last panel at the sides and the top panel on the ends, which is 3/16 in. thick. Two 6-in., 8-lb. channels form the end posts.

Seventy-Ton Hopper Car.—This car has an estimated weight of 49,500 lb. The center sill and plates are very similar to the 55-ton car. The body bolsters are made up of 5/16 web plates with ⅜-in. reinforcing plates, 3½-in. by 3½-in. by ⅜-in. bottom angles and a 14-in. by ½-in. bottom cover plate. The side stakes are pressed from ¼-in. plate, and the end posts are 6-in., 8-lb. channels with 3½-in. by 3½-in. by 5/16-in. angle corner posts.

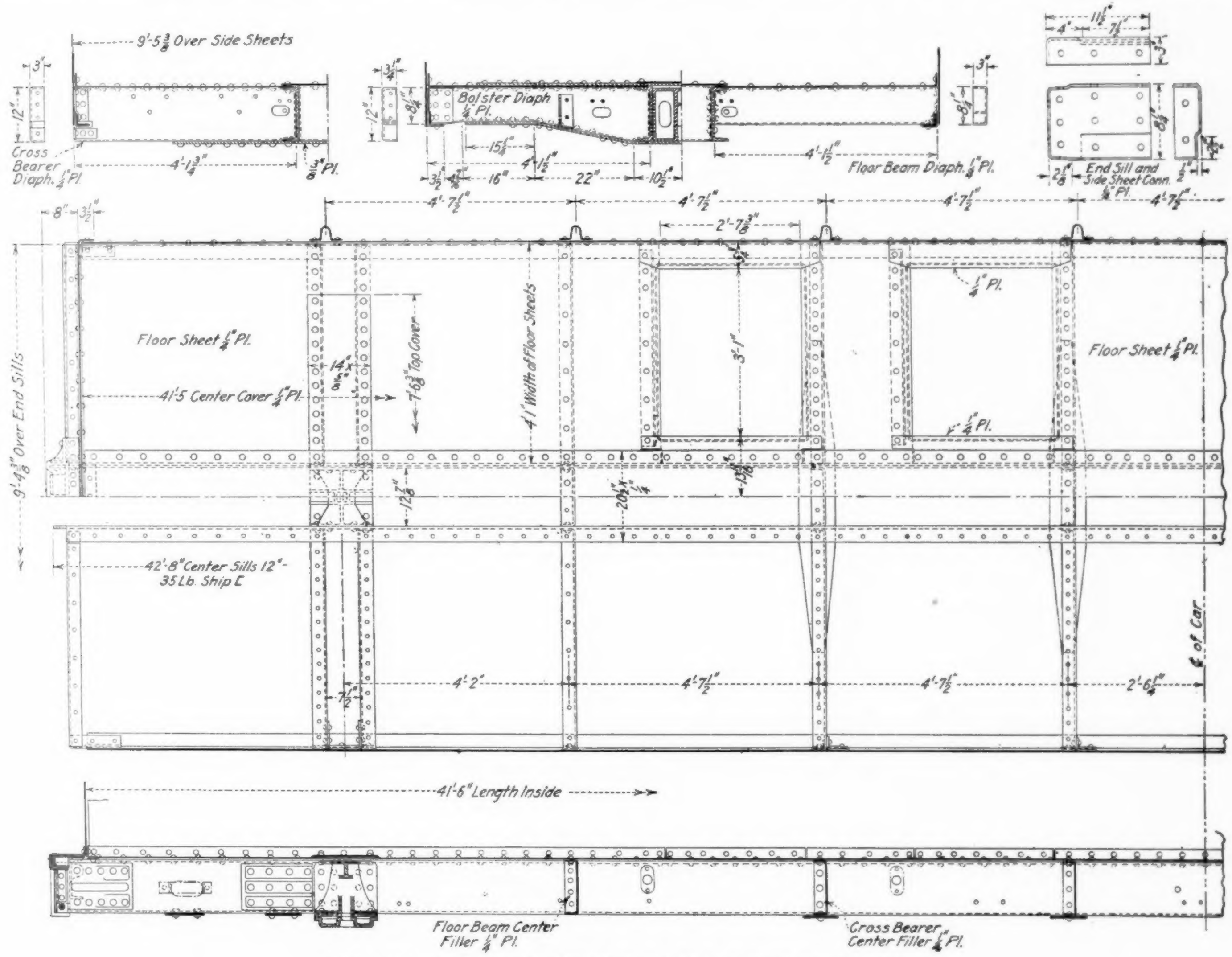

Fig. 14—Underframe for the Standard 50-Ton Steel Gondola Car

TRUCKS

The trucks for all of the standard cars are covered by three specifications, one for 40-ton cars, one for 50-ton cars and one for 70-ton cars. Following are the general dimensions:

	40-ton	50-ton	70-ton
Wheel base	5 ft. 6 in.	5 ft. 6 in.	5 ft. 8 in.
Distance center to center of journals	6 ft. 4 in.	6 ft. 5 in.	6 ft. 6 in.
Size of journals	5 in. by 9 in.	5½ in. by 10 in.	6 in. by 11 in.
Diameter of wheels	33 in.	33 in.	33 in.

The specifications for all three trucks are similar, the provisions in the majority of cases being identical. The trucks for the 40- and 70-ton cars are each required to be of ample strength to carry a load 10 per cent above the rated capacity in addition to the light weight of the car body. The 50-ton

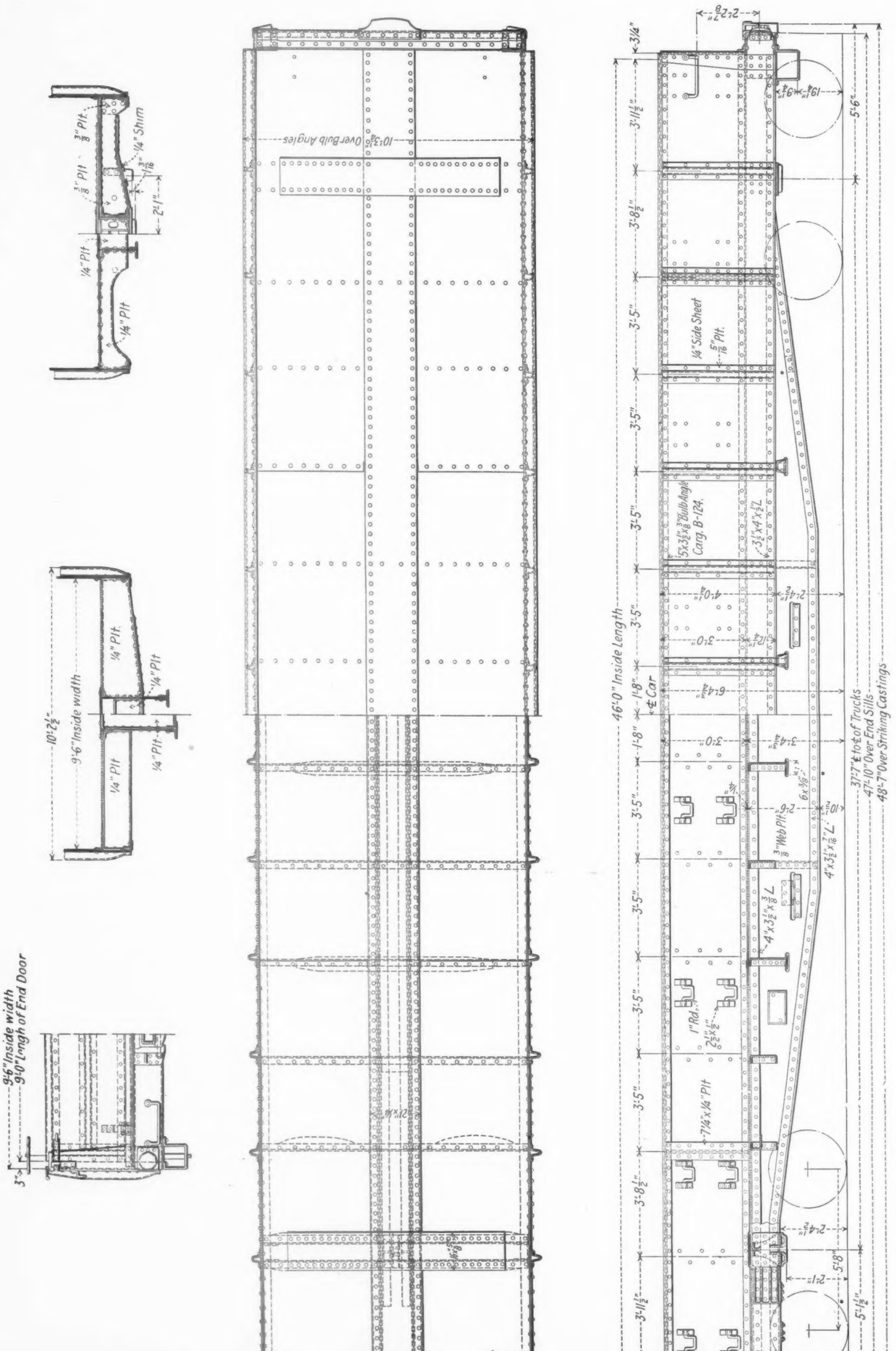

Fig. 15—General Plan of the Standard 70-Ton Low Side Gondola Car

truck, while nominally for cars of that capacity, is required to carry a load of 121,000 lb. in addition to the light weight of the car body, thus making it available for use under 55-ton cars. Except in the case of those sections which are not identical for all three trucks, the text of the specifications is given below. Sections where differences occur have been summarized to cover all three trucks and the difference clearly pointed out.

Material Options.—Wherever more than one kind of material or construction is shown on drawing or mentioned in specification, it is understood that either may be furnished

spects with arch bar truck where this type of truck is permitted. They must be made in accordance with M. C. B. specifications and have a transverse section modulus in the top member of eight for the 40-ton truck, 10 for the 50-ton truck, and 12 for the 70-ton truck.

Truck Bolsters.—To be: (1) Cast steel bolster with integral center plate; (2) cast steel bolster with separate center plate, or (3) pressed steel or built-up bolster. Inside bearing surface of cast steel center plate to be dressed. Cast steel and built-up bolsters must interchange with pressed steel bolsters. Cast steel bolsters must have a section mod-

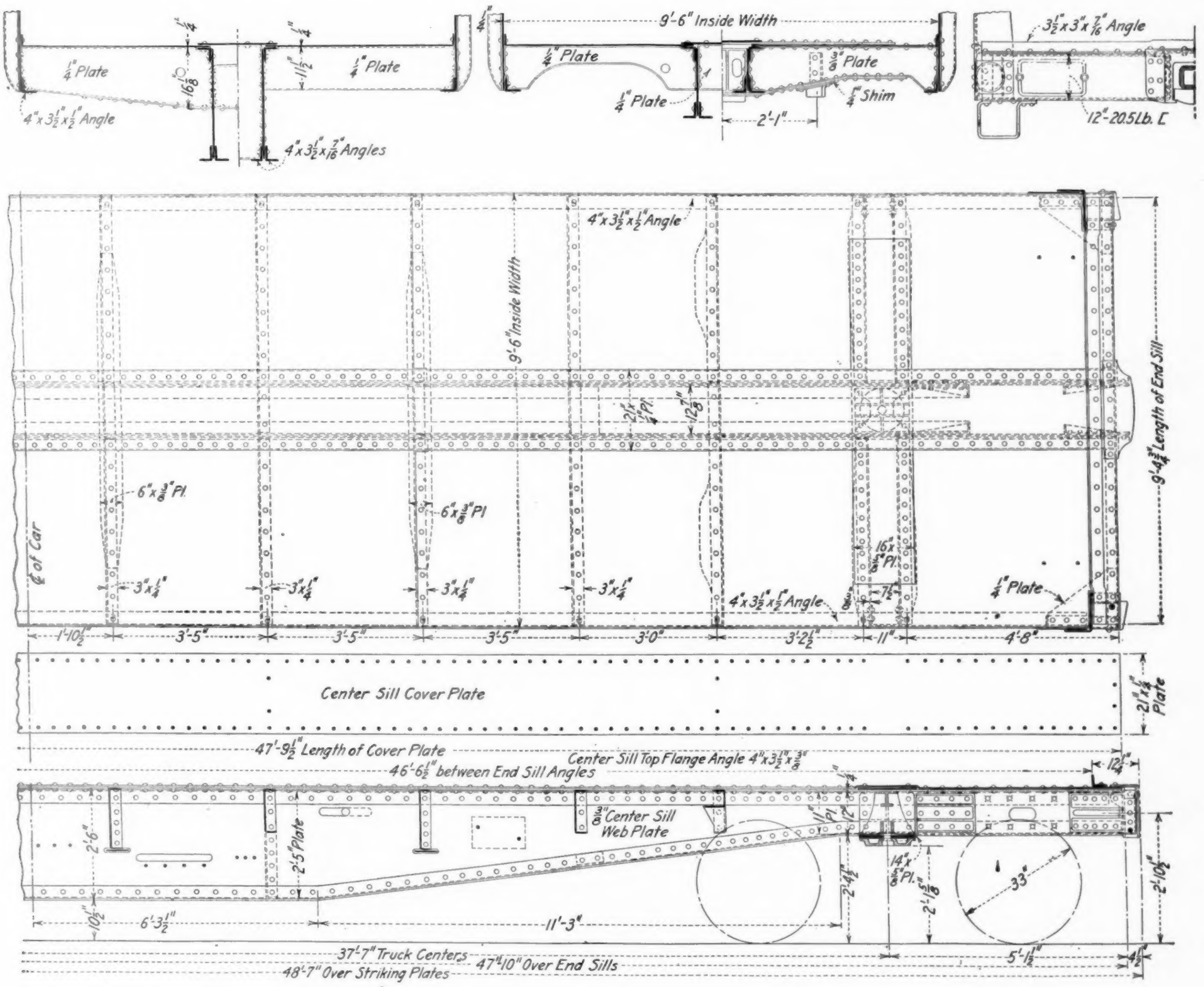

Fig. 16—Underframe for the 70-Ton Steel Gondola Car

by the builder unless otherwise specified. Specialties to be as covered in contract.

Forgings.—Forgings may be made of either steel or wrought iron.

Truck Frames.—For the 40- and 50-ton trucks, the truck frames are to be: (1) Cast steel side frame of U-section members with M. C. B. standard removable journal box; (2) cast steel side frame of U-section members with journal box cast integral, or (3) arch bar type. Except for the exclusion of the arch bar type, the same types of side frame are specified for the 70-ton truck.

Tie bars for cast steel truck side frame to be of the short type, two per frame.

Cast steel side frame must meet limiting dimensions shown on limiting dimension drawing, and interchange in all re-

ulus vertically 10 per cent greater than pressed steel bolsters. Built-up bolsters must be as strong vertically as pressed steel bolsters. All bolsters to have a transverse strength at least 50 per cent of vertical strength.

Center Plates.—(1) Drop forged, or (2) cast steel.

Side Bearings.—See body specifications.

Brake Beams.—Each 40-ton and 50-ton truck to be equipped with two M. C. B. No. 2 brake beams, and each 70-ton truck to be equipped with two M. C. B. No. 3 brake beams, all conforming to limiting outline and general conditions shown on drawing.

Brake Shoes.—To be: (1) With reinforced back, or (2) plain cast iron.

Wheels.—For the 40-ton trucks the wheels are to be M. C. B. standard for cars having axles with 5-in. by 9-in.

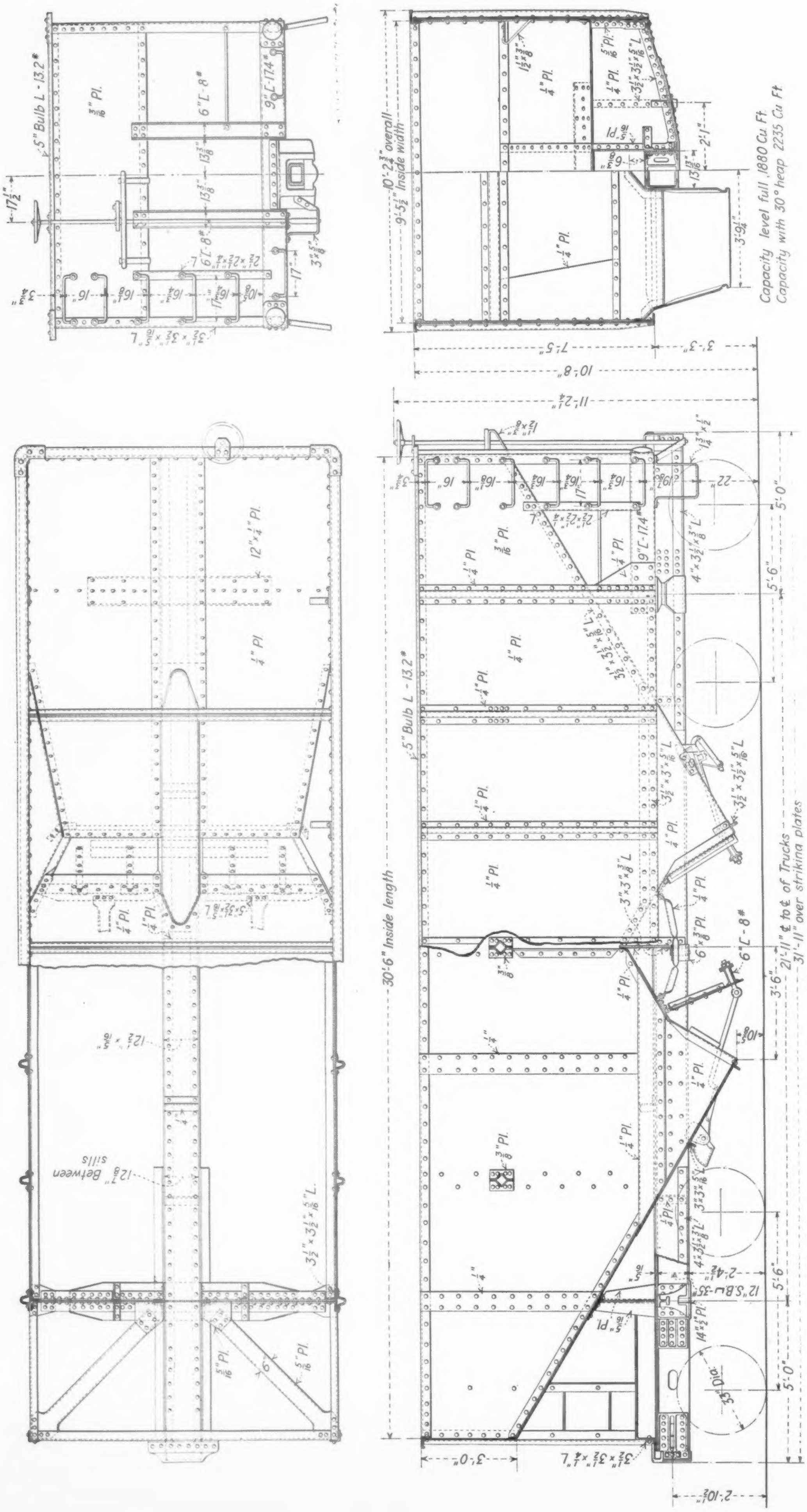

Fig. 17—General Plan of the Standard 55-Ton Hopper Car

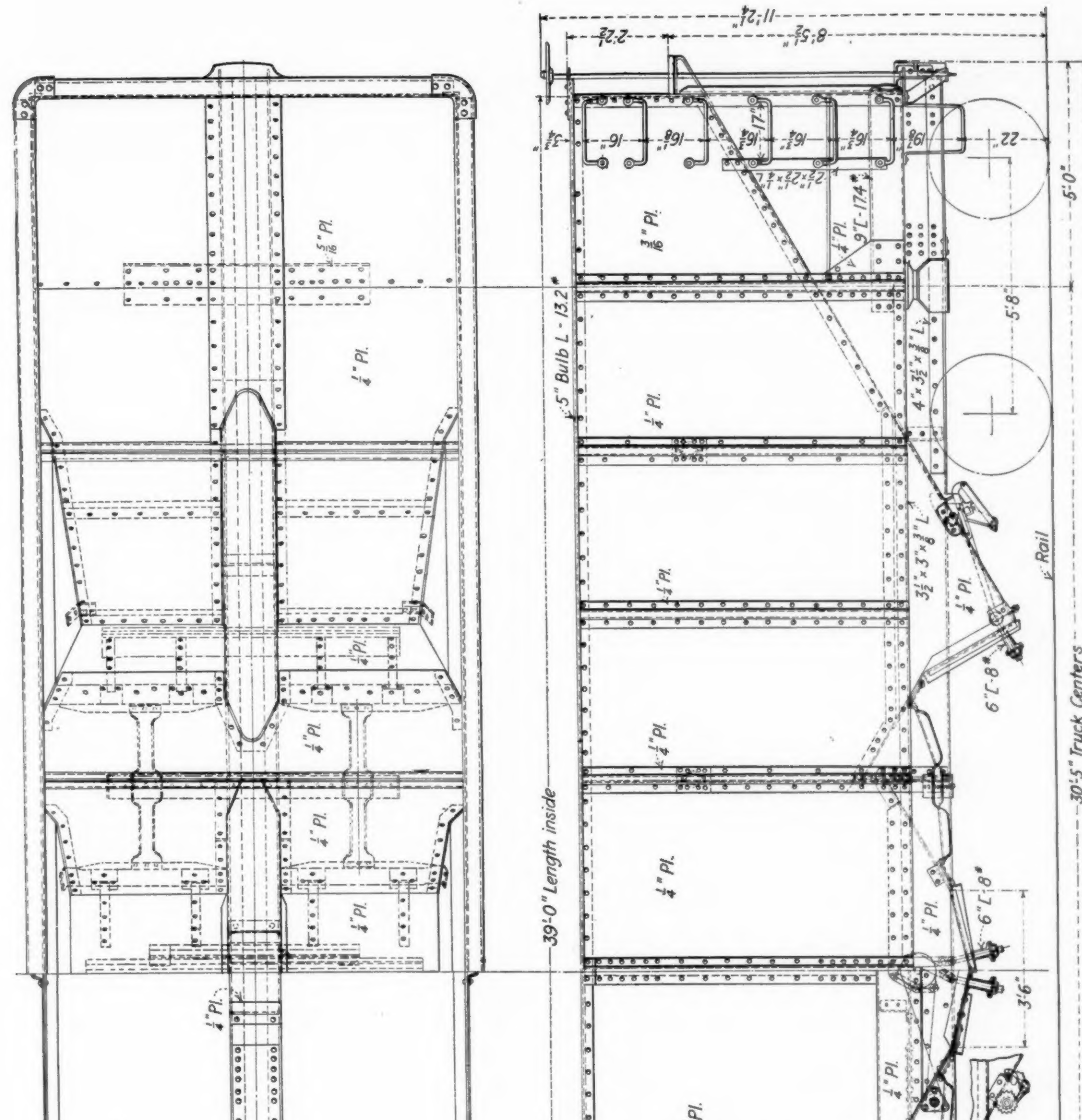

Fig. 18—General Plan for the Standard 70-Ton Hopper Car

journals. To be cast iron, weighing about 700 lb. each. Wheels to be in accordance with M. C. B. specification, and to be mounted on axles with a pressure of from 40 to 60 tons.

For 55-ton hopper cars, the wheels are to be: (1) wrought steel, (2) cast steel, or (3) cast iron. For all other 50-ton cars the wheels are to be cast iron. Wheels to be M. C. B. standard for cars having axles with 5½-in. by 10-in. journals. Cast iron wheels to have a nominal weight of 725 lb. each. Cast iron wheels to be mounted on axles with a pressure of from 45 to 65 tons, and steel wheels with a pressure of from 65 to 85 tons.

The wheels for the 70-ton truck are to be M. C. B. standard, wrought steel, for cars having axles with 6-in. by 11-in. journals. They are to be in accordance with M. C. B. specifications, and mounted with a pressure of from 70 to 95 tons.

Axles.—To be of open hearth steel, smooth forged or rough turned between wheel seats and journals to be burnished. To be in accordance with M. C. B. specifications with sulphur and phosphorus content modified to limit of .06.

Journal Boxes.—To be of malleable iron, cast or pressed steel, complete with lids and M. C. B. type reinforced wooden dust guards suitable for axles with 5-in. by 9-in. journals, 5½-in. by 10-in. journals, or 6-in. by 11-in. journals, as the case may be. All boxes to be thoroughly cleaned and packed

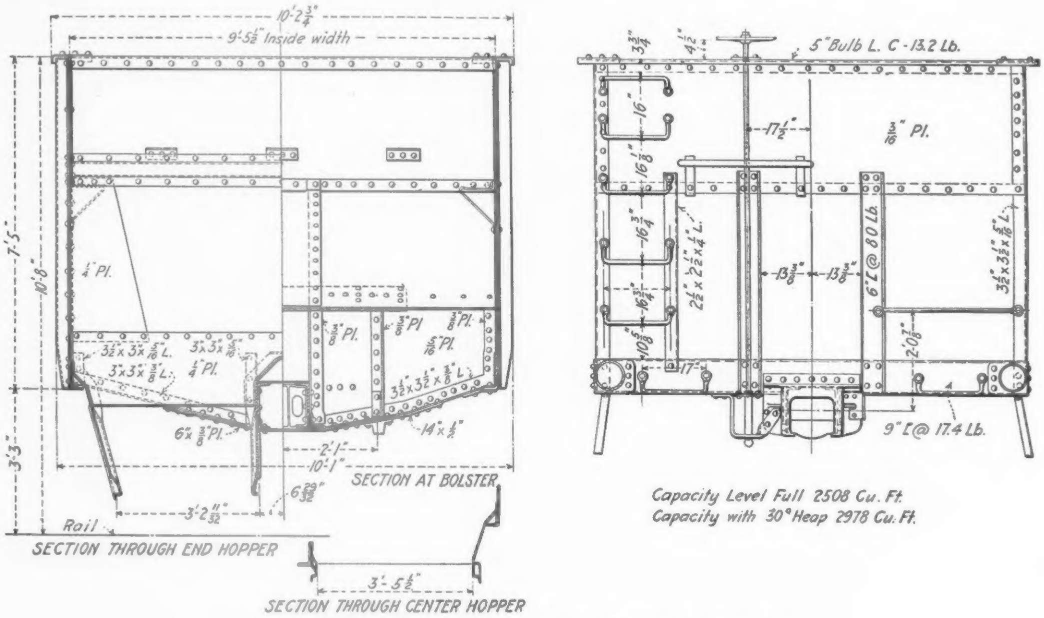

Fig. 19—Sections of the Standard 70-Ton Hopper Car

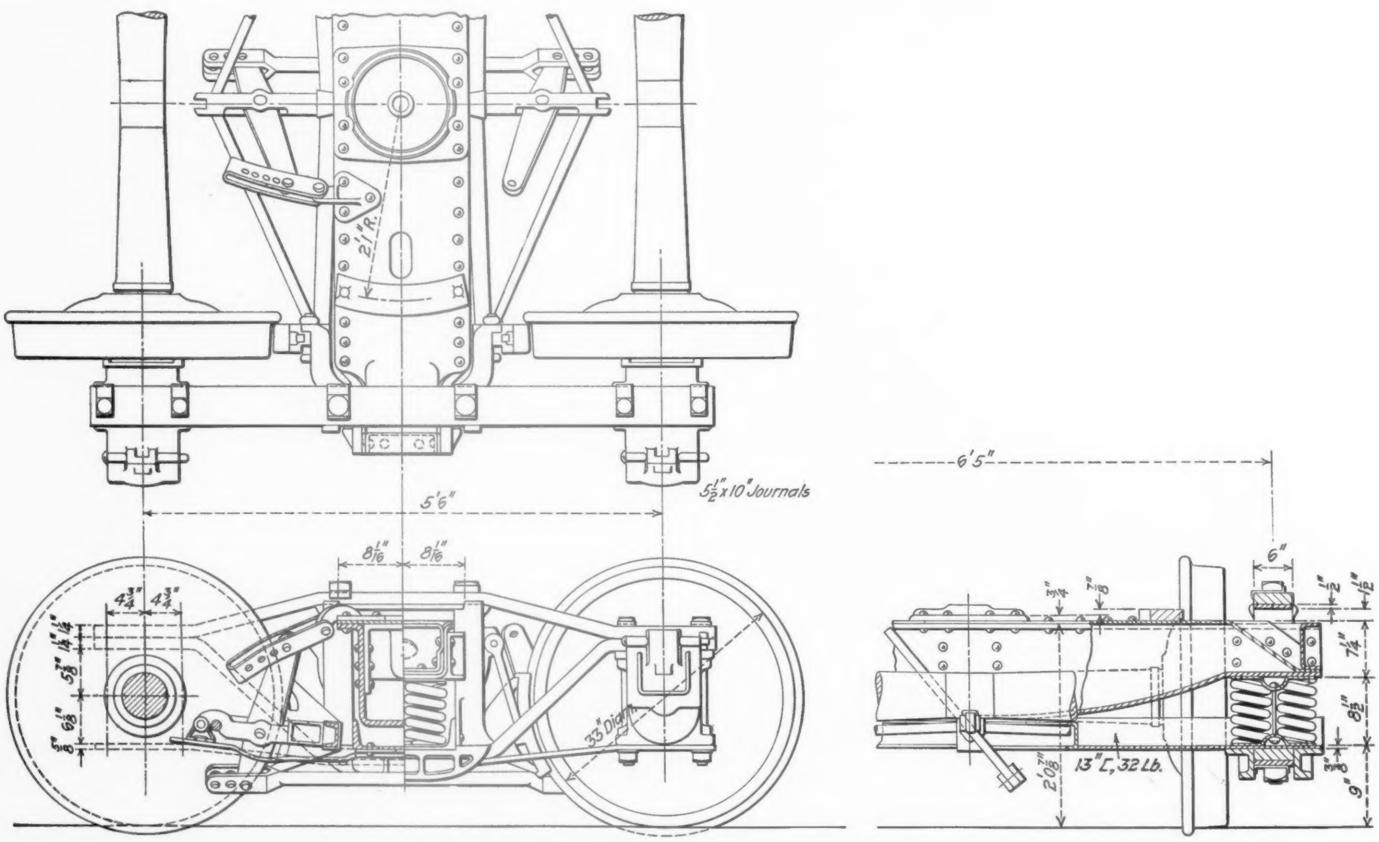

Fig. 20—General Plan of the Standard 50-Ton Truck

with journal box packing which has been saturated with freight car lubricating oil.

Journal Bearings.—To be of brass, lead lined, M. C. B. specification grade "A."

Journal Bearing Wedges.—To be: (1) drop forged, or (2) cast steel. Wedges to be M. C. B. type, suitable for axles

Painting.—Trucks to receive two coats of carbon black paint. Paints to be in accordance with United States Standard Specification which are shown in the specifications for the car bodies.

The following United States Standard Specifications, for journal box packing and journal box oil, are to apply:

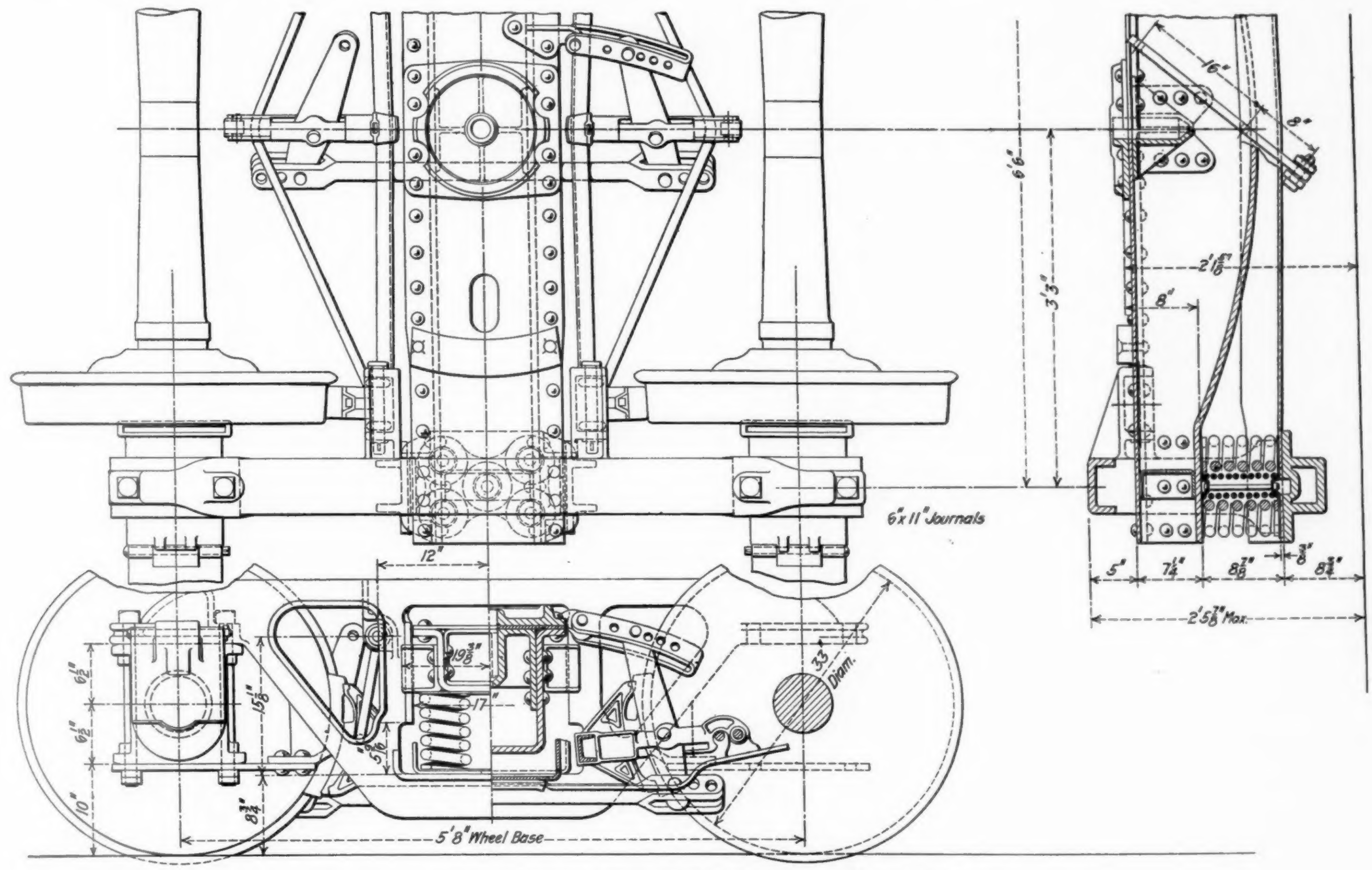

Fig. 21—General Plan of the Standard 70-Ton Truck

with 5-in. by 9-in., 5½-in. by 10-in., or 6-in. by 11-in. journals, as the case may be.

Material Specifications.—The following M. C. B. specifications for materials are to apply:

Axles
Bolts and nuts
Boiled linseed oil
Brake beams
Brake shoes
Carbon steel bars for railway springs
Cast iron wheels
Cast steel bolsters
Cast steel truck side frames
Steel wheels
Helical springs
Japan drier
Journal bearings
Malleable iron castings
Mild steel bars
Steel castings
Pressed steel bolsters
Raw linseed oil
Red lead
Rivet steel and rivets
Structural steel, steel plates and steel sheets for freight equipment cars
Turpentine
White lead for lettering
Wrought iron bars

JOURNAL BOX PACKING SPECIFICATIONS

The material desired under these specifications is curled vegetable fiber so curled as to impart to it the maximum resiliency; wool and cotton threads free from large lumps of any one component part and thoroughly machined and intimately mixed with the curled fiber in the following proportions:

(A)—Vegetable fiber—20 per cent
(B)—Wool waste —40 per cent
(C)—Cotton waste —40 per cent

JOURNAL BOX OIL SPECIFICATIONS

The oil required shall be well oil, and will not be accepted if it: (1) flashes from May 1 to October 1, below 298 deg. F., or from October 1 to May 1, below 249 deg. F.; (2) has

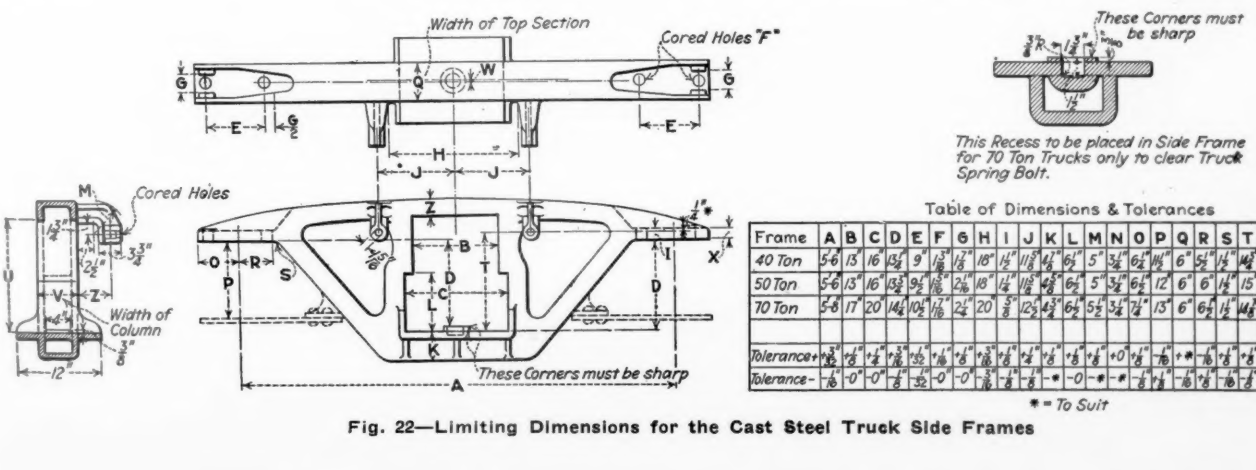

Table of Dimensions & Tolerances

Frame	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z
40 Ton	5'6"	13"	16"	13¼"	9"	1 3/16"	1 7/8"	18"	1½"	11 5/8"	4 7/8"	6½"	5"	3¼"	6¼"	11½"	6"	5½"	1½"	14¾"	11 5/8"	6"		2¼"	5"
50 Ton	5'6"	13"	16"	13¾"	9½"	1 5/16"	2 1/16"	18"	1¼"	11 5/8"	4 5/8"	6½"	5"	3¼"	6½"	12"	6"	6"	1½"	15"	11 7/8"	6"		2½"	5½"
70 Ton	5'8"	17"	20"	14¼"	10½"	1 7/16"	2¼"	20"	5/8"	12½"	4¾"	6½"	5½"	3¼"	7¼"	13"	6"	6½"	1½"	14 7/8"	11 7/8"	6"		2½"	6"
Tolerance +	+3/32"	+1/8"	+1/4"	+3/16"	+1/32"	+1/16"	+1/8"	+3/16"	+1/8"	+1/4"	+1/8"	+1/8"	+1/8"	+0"	+1/8"	−1/16"	+*	−1/16"	+1/8"	+1/8"	+3/16"	+1/16"	+3/32"	+1/16"	+1/16"
Tolerance −	−1/16"	−0"	−0"	−1/8"	−1/32"	−0"	−0"	−3/16"	−1/8"	−1/8"	−*	−0	−*	−*	−1/8"	+1/2"	−1/16"	+1/8"	−1/16"	−1/8"	−1/8"	−1/16"	−1/16"	−1/16"	−1/16"

* = To Suit

Fig. 22—Limiting Dimensions for the Cast Steel Truck Side Frames

a gravity at 60 deg. F. below 28 deg. or above 31 deg. Beaume; (3) from October 1 to May 1, has a cold test above 10 deg. F., and from May 1 to October 1, has a cold test above 32 deg. F.; (4) shows any precipitation when five cubic centimeters are mixed with 95 cubic centimeters of gasolene.

The precipitation test is to exclude tarry and suspended matter. It is made by putting 95 cubic centimeters of 88 deg. B. gasolene, which must not be above 80 deg. F. in temperature, into a 100 cubic centimeter graduate, then adding the prescribed amount of oil and shaking thoroughly. Allow to stand 10 minutes. With satisfactory oil no separate or precipitated material can be seen.

There is a marked similarity between the 40- and 50-ton trucks, and for that reason but one has been shown in the illustrations. The 40-ton truck calls for arch bars of 1⅛-in. material, while the 50-ton truck (Fig. 20) calls for arch bars of 1¼-in. material. The 70-ton truck is shown (Fig. 21) with the cast steel side frame, as the arch bar type is not permitted to be used on this truck. The limiting dimensions all side frames must meet is shown in Fig. 22.

The pressed steel bolsters for the 40- and 50-ton trucks are of similar design, the chief difference being in the weight of material used. The 50-ton bolster design is shown in Fig. 23. The bottom plate is ⅝ in. thick in the 50-ton and ½ in. thick in the 40-ton. The 70-ton truck bolster, which is shown in Fig. 24, it will be noted, is of somewhat different design. Cast steel and built-up bolsters may be used instead of the pressed steel bolster. All of the brake beams must conform to the limiting outline shown in Fig. 25.

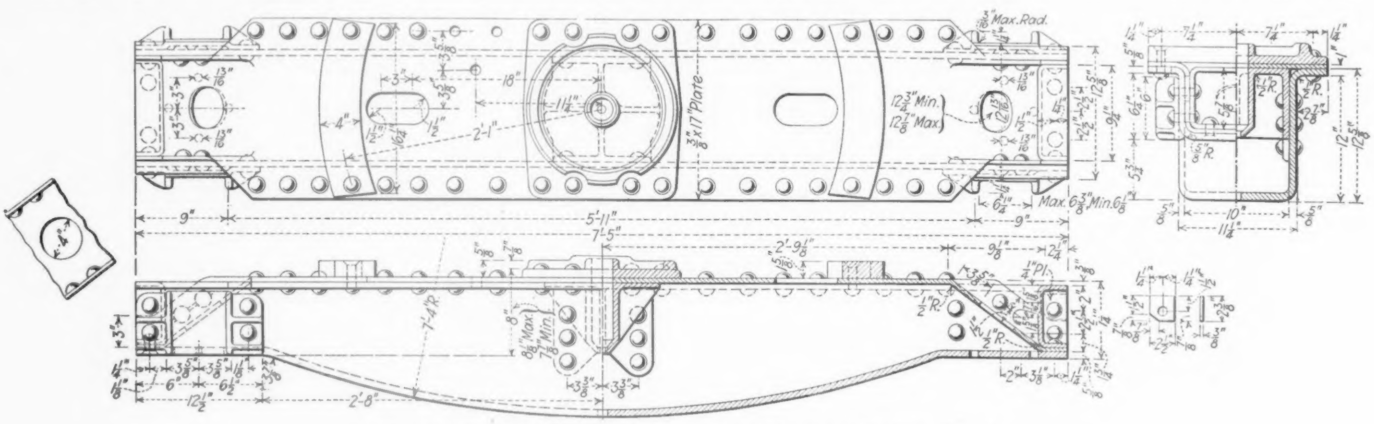

Fig. 23—Pressed Steel Bolster for the Standard 50-Ton Truck

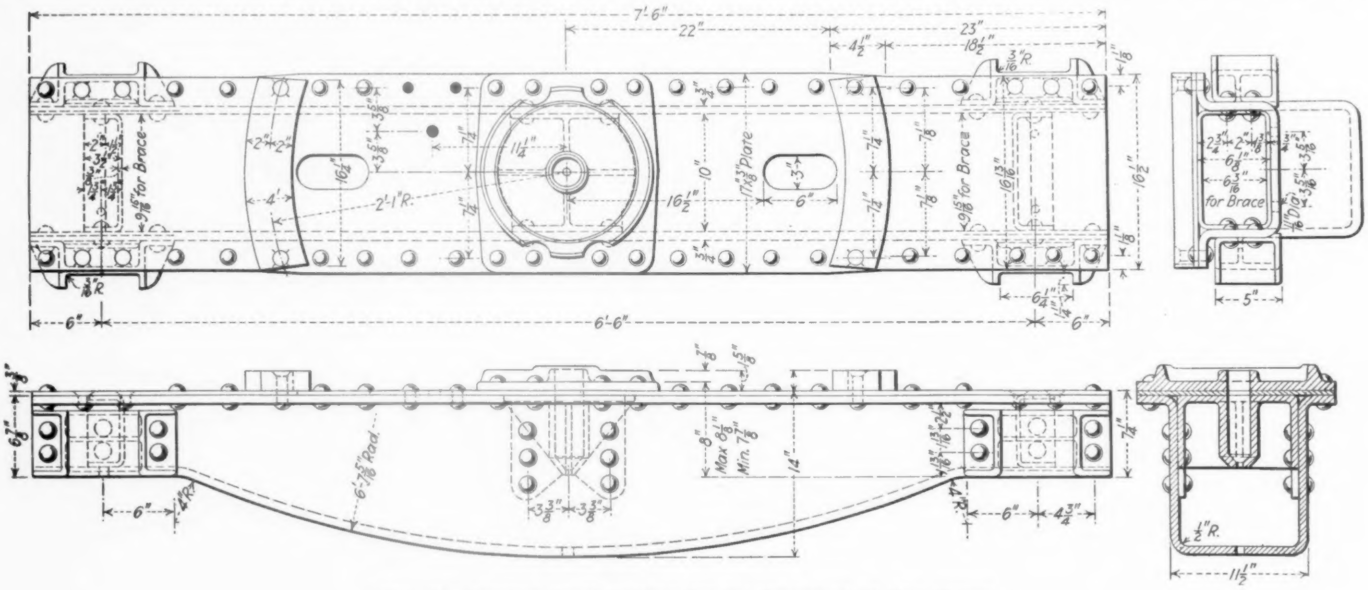

Fig. 24—Pressed Steel Bolster for the Standard 70-Ton Truck

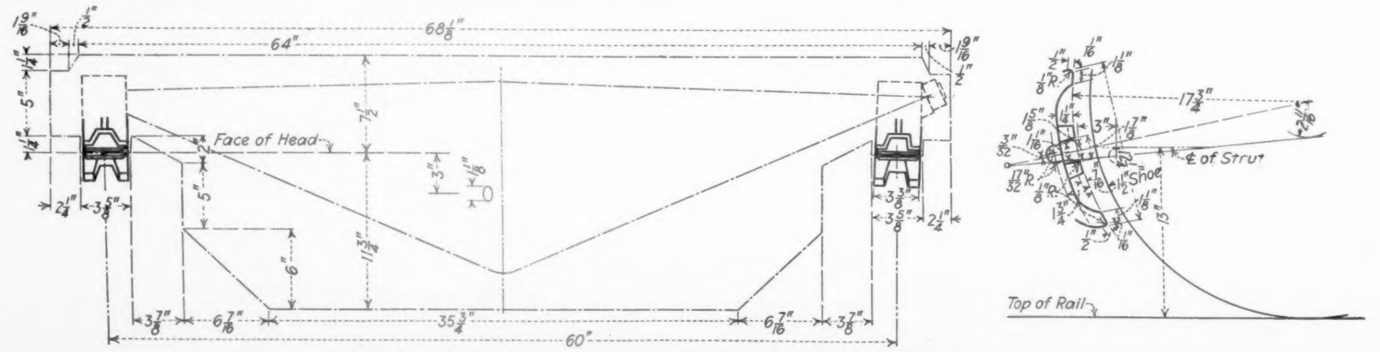

Fig. 25—Limiting Outline for the Standard Brake Beams

Machine Tool Equipment Needed

To Better Meet the Needs in Repairing Locomotives and Cars the Shop Equipment Must Be Improved

During the years immediately preceding the outbreak of the European war, the railroads of the United States spent approximately $12,000,000 annually for shop machinery and tools. In the year 1914 there was a serious falling off in the net operating revenue of the roads, and as a result the expenditures were reduced wherever possible. Consequently only $9,000,000 was spent for machinery and tools during 1915. Throughout the past two years there has been an unusually strong demand for machine tools for war work and the railroads have confined their purchase principally to tools which were urgently needed. Although no general statistics are available, it is safe to say that the expenditures for tools have been even smaller during the past two years than in 1915. With the great advance in prices, a given expenditure of course represents a much smaller amount of shop equipment. Taking this into account and considering also that the roads are handling far more traffic than ever before, it is quite evident that they are in need of a large number of machine tools at present.

Although there has been no reduction in the prices of machine tools, other changes have taken place which should not be overlooked when considering the advisability of making purchases. The past year has brought large wage increases to all classes of mechanics. While in 1915 the total compensation paid by the roads to mechanics, helpers and apprentices was over $90,000,000, for the present year it will probably be 40 per cent higher, or about $125,000,000. There are but few methods that can be used to offset this increase. One that deserves attention is the use of improved machine tools to increase the output per man. Suppose only 2 per cent more output could be secured by providing better tools. Figuring interest and depreciation at the rate of 12 per cent annually this saving would justify the expenditure of more than $20,000,000. All who are familiar with shop conditions will agree that with improved equipment much greater economies could be effected. Aside from the direct saving in labor there would be opportunities for increasing the efficiency of operation by reducing delays and making it possible to get more service from equipment.

During the past winter it was impossible to care for equipment properly at some points, due largely to the inadequacy of the roundhouse facilities. The machine tool equipment of engine terminals is usually made up of tools that have outlived their usefulness in the shop and should have been sent to the scrap pile instead of to the roundhouse, where time lost in doing the work may result in costly delays.

The need of first-class tool equipment in roundhouses has been recognized for some time. One superintendent of motive power recently stated that he thought with the large locomotives now in use requiring frequent heavy work, every roundhouse should have a few pits equipped for handling heavy repairs in order that the heavy roundhouse jobs could be taken care of promptly. The necessity for keeping down the expenditures has prevented roads from buying the equipment they have required in the engine houses. Better facilities at these points will help to provent such costly congestion as occurred last winter, and should certainly be provided.

Although the machine tools most urgently needed are those required for roundhouse work, many shops should have additions for their equipment, or replacements for obsolete tools. There are wide variations in the conditions on different roads. Some have followed a consistent policy of buying shop machinery regularly as additional rolling stock was secured. On other roads the repair facilities are not sufficient to take care of the equipment under the present conditions. It is, of course, advisable to have all locomotives repaired on the home road if possible. While it may not be feasible to build additional shops at this time, the capacity of existing shops is usually limited, not by the number of pits but by the machine facilities and in most cases a few tools, judiciously chosen, will make it possible to increase the output considerably.

The question of providing good repair facilities is of such importance that it should receive first consideration when ordering tools. Under the present conditions, however, the reclamation of materials offers such unusual opportunities for reducing expenses that it may be found advisable to include a considerable amount of machinery in the tool program for such work. As specific instances of equipment that is being reclaimed to good advantage at this time flues, rails and bar iron may be mentioned.

Granting that the roads need a great many machine tools at this time, the question of their ability to secure them naturally suggests itself. There seems to be a general opinion among railroad men that tools of all classes are hard to get and deliveries are very slow. While it is true that in the past there have been delays in securing tools, the situation has improved and reasonable deliveries are now being promised on practically all types of machines.

Before going into the subject more in detail, it may be well to give a short account of the work of the machine tool section of the War Industries Board. Although an advisory body without executive authority, the board has done much good in directing the manufacture and distribution of machine tools. A schedule of production was secured from every shop and from the data furnished it was determined whether the production of various machines was greater or less than the demand. This made it possible to commandeer tools with the minimum of inconvenience to private industries. The requirements of munition plants are being estimated and a reserve of tools set up for such work. Companies which formerly did not manufacture machine tools have been induced to enter the field, thus increasing the production of machines that were badly needed. By preventing speculation in machine tools the board has helped to keep the prices on a reasonable basis. While there has been some costly duplication of facilities, the production and the demand have been controlled as much as possible and the conditions are fast becoming normal.

The commandeering of tools for government work has not interfered with the delivery of tools to railroads to any great extent. Since the roads are now under government control they will probably be given preference in arranging for priority of orders. Some of the tools which the railroads use in large number can now be delivered from stock, and nearly all can be secured within six months from the date ordered. In fact the only classes of equipment on which deliveries are much slower than usual are the extremely heavy tools and special equipment of which small numbers are built.

Good Deliveries in Most Cases

Information received from the manufacturers of tools indicates that the conditions as regards deliveries are at the present time about as follows:

Lathes: A few of the smaller sizes can be delivered from stock. On the larger sizes deliveries vary from two to seven

months, depending on the swing and length of bed. It is almost impossible to secure wheel lathes, as plants equipped to manufacture large tools are devoting all their time to working on government orders.

Turret lathes: All sizes and types can be furnished in from two to five months' time.

Boring mills: With the exception of the larger sizes used for tires and wheel centers, deliveries can be secured in from two to three months. The larger machines are not available at this time and probably cannot be secured for some time to come.

Planers: No class of equipment has been more in demand than large planers. The urgent need for these tools for war work has led to the introduction of a new type of machine which has a concrete base. The medium and smaller sizes can be secured in from four to twelve months, however.

Milling machines: Deliveries of the ordinary sizes of plain and universal milling machines can be made within six to twelve months, while for heavy milling machines the time is somewhat longer.

Shapers: Deliveries vary from four to eight months.

Drill presses: Sizes up to six feet can be secured in from three to eight months; on radial drill presses and on the other types the time required is even shorter.

Cylindrical and surface grinding machines: Small stocks of some sizes are on hand and other machines can be supplied in from two to eight months.

Portable tools: All types and sizes can be furnished within two months from the date ordered.

Electric welding equipment: Deliveries can be made in from one to three months.

Electric motors: All sizes required for driving machine tools can be furnished within two months.

Blacksmith and boiler shop equipment: Steam and power hammers can be supplied in from two to four months, forging machines in six months and bolt machinery in three to five months. Deliveries of punches and shears can be made within one month; flangers are available within four months.

Wood working machinery: Deliveries are practically normal, one to three months being required to fill orders depending on the type of machine wanted.

From the data given above it is evident that while some difficulty might be experienced in securing complete equipment for new shops owing to the great demand for certain types of machines, the ordinary requirements can be met with but little delay. Machine tool prices are stable and there is no longer any thought of postponing buying in anticipation of a possible decrease in prices. The railroads have everything to lose and nothing to gain if they restrict their orders for machine tools. With labor costs continually rising, they have every inducement for replacing the old equipment with modern machine tools. The roads must operate at the highest efficiency in order to handle the present enormous traffic. Better shop equipment will help them to realize that aim. Their purchases in the past three years have been entirely inadequate, but this year the roads should make up for it and should place larger orders for machine tools than during any previous year.

OLD TRACINGS ASKED FOR BY RED CROSS.—The American Red Cross requests manufacturers and others using tracing cloth to donate discarded tracings to the Red Cross. The tracings are washed and the material—linen or cotton—is employed for the making of surgical dressings to be used in the field hospitals. The Red Cross has made arrangements with large laundries in all cities to collect material of this kind, and any organization wishing to aid should call up the local Laundry Owners' Association, or one of the large laundries in his city, who will send for such material as he will give them.

ORGANIZATION MAINTENANCE*

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One of the greatest problems before the railroads, as a result of the present intense industrial activity, is that of keeping up their organizations to a point which will accomplish the necessary results. Chief among the factors which make this problem difficult is the constantly changing personnel of the organizations, brought about by officers and foremen as well as workmen leaving railroad service for military or industrial occupations. For many years railroads have been operated by men of long experience in that particular work; the workmen as well as those in supervising capacities were thoroughly familiar with the details, and properly handled most situations as a matter of routine and with very little detailed instruction. This brought about a situation, where the proper handling of a given task was frequently put up to the workman to whom it was assigned with practically no detailed instruction from the man who assigned the work; the workman was supposed to know his business.

Conditions have changed in recent months, and on all the railroads we are doing the work with men who, in many cases, have had no previous railroad experience; this applies to the road work as well as shop work. This condition makes a heavy burden on supervision and it is necessary for supervision to change its methods materially; the work can no longer be put up to the man without instruction. When a man lacks previous experience, or perhaps lacks initiative, it is necessary to instruct him in detail concerning the work which he is to do, and in many cases even supervising officers and foremen, who may be new in their present positions, do not understand very definitely just what is expected of them.

Difficulty in getting results is sometimes ascribed to indifference on the part of the men, and while this may be so in many cases, it is also true that much of the difficulty is due to lack of experience of the men, and lack of proper supervision and instructions. There are many conditions existing in shops and engine houses which were not very strongly objected to by the old timers, who were used to them, but which contribute quite largely to indifference and inefficiency on the part of the new and inexperienced employees. Some of these conditions are, poor light, lack of sufficient heat, poor floors, lack of proper small tools and worn out machinery. Men who are used to working with labor saving devices do not take kindly to places where they have to do the same work by main strength and awkwardness.

There is no question that a much heavier burden has been placed on our supervision, on account of the necessity of giving detailed instructions to new men, which were not required with the older men, and where this has been recognized, and where the supervising force has been organized to meet the conditions, excellent results may be obtained which will more than repay the additional expense.

The continual changing of the working force, requiring the constant educating of new men, requires more than usual courage, resourcefulness, cheerfulness and enthusiasm on the part of the foremen, as well as ability in their particular kind of work. Nothing is more important at this time than to inspire these qualities in the men who are close to the firing line.

In the present emergency, I am prompted to quote from the address of J. F. Deems, when he was president of the American Railway Master Mechanics Association in 1907: "We may work in brass and steel and leave the most perfect mechanism; we may develop and improve and evolve methods and practices until nothing more can be desired; we may

*Abstract of a paper presented before the Western Railway Club.

reach perfection in all these, in mechanism, structure and method, and yet our bequest be a failure and itself a burden unless we provide that which is paramount, which is over and above the sum total of all this, and for which, even today, events throughout the world are crying aloud—the man. A man prepared, experienced, earnest; hopeful and happy; consecrated to his work and ready to the hand of the future." There are many such men in our organizations; some of them we know, others we have not yet discovered, and it is up to us to know that our working conditions in shops and on the road are the best that can be afforded, that our supervision is ample and capable, so that men will understand their duties and will be happy, contented and enthusiastic in the performance of them, in order that nothing may be left undone to give our last ounce of energy in supporting this Government and those who are fighting for us to win this war.

DISCUSSION

The consensus of opinion was that there is need for an increased number of foremen at this time. Less supervision is required where the piece work system is in effect than where the men are on day work. Some stated that it was impossible to get men to stay on the work long enough to train them. A. R. Kipp (Soo Line) brought out the fact that the workers at this time have not the same spirit as formerly and it will take a different kind of supervision to secure results. As there is a spirit of carelessness and indifference in the workers, the foremen must put in a personal touch to give them inspiration and incentive. T. H. Goodnow (C. & N. W.) expressed the opinion that the seniority rule makes it very difficult to secure foremen and often makes it impossible to get the best men who could be chosen in supervisory positions. The organization and rules of the unions have removed the ambition which workers formerly had. Another difficulty is due to the fact that the majority of men now doing the work in some departments are foreigners. With the shortage of labor and the attitude of the labor organizations it is difficult for the foremen to secure results. The men in the higher positions should uphold the foremen in order that they may secure the support of the men in the ranks.

FREIGHT CAR AND TENDER TRUCK BOLSTERS

An Explanation of the General Principles Involved in the Design, Loading and Testing of Truck Bolsters

BY G. S. CHILES AND R. G. KELLEY

THE decided lack of uniformity in the specified requirements of various railroads regarding the design and testing of truck bolsters for cars and locomotive tenders appears to warrant the following investigation. It is proposed to develop a method of testing such bolsters, especially with regard to the method of loading, which will be more in harmony with the designing practice of the present day. Disregarding such factors as the chemical and physical properties of the steel, annealing, workmanship, finish, marking, weight, test coupons, etc., the question of design will be confined to a consideration of the method of loading, allowable fibre stress, method of testing and the specified deflection and set. As the general principles involved in a specific case are of interest rather than a tabulation of differences for bolsters of various capacities the investigation will be limited to those used under 50-ton freight cars.

The specifications of some railroads call for an allowable, calculated fiber stress for a given vertical and transverse load, and as this is, perhaps, best illustrated by a sample of the usual form of specification, the following examples are submitted. While the requirements for the transverse loads are also included, the discussion which follows will have to do primarily with the vertical requirements:

Example 1—"Bolsters are to be designed for maximum fibre stress not to exceed 10,000 lb. per square inch under a 72,000 lb. vertical load concentrated at the center plate, with supports at centers of spring bearings."

Example 2—"Bolsters must be designed to carry upon the center plate when supported at the spring seats, with an extreme fibre stress of not more than 16,000 lb. per square inch, a static load of 100,000 lb."

Example 3—"Cast steel truck bolsters must be designed for vertical loads delivered at the center plate by the body bolster. This load on each truck bolster is to be taken as one-half of the total load, which is comprised of the sum of the following:
(A)—Light weight of car body above truck bolsters.
(B)—Rated capacity of car plus 10 per cent overload.
(C)—Fifty per cent of the sum of (A) and (B) for impact. Direct stresses due to vertical load must not exceed 15,000 lb. per square inch."

Example 4—"Bolsters are to be calculated by the three following methods, and in no case should the maximum stress exceed 9,000 lb. per square inch.
(A)—Vertically with 73,000-lb. load concentrated on center plate and bolster supported at centers of spring bearings.
(B)—Vertically with 73,000-lb. load concentrated equally on one side bearing and center plate and bolster supported at centers of spring bearing.
(C)—Transversely with a load equal to 50 per cent of vertical loading and concentrated at center in transverse direction, with bolster supported at center of column."

It is plainly evident that the specified requirements of Example 2 are equivalent to limiting the fibre stress to 10,000 lb. for a center plate load of 62,500 lb., or to 11,000 lb. for a center plate load of 68,750 lb. For a 73,000-lb. center plate load, the equivalent stress would be 11,190 lb. per square inch.

In the specification cited in Example 3, limiting fibre stress of 15,000 lb. per square inch is specified, based upon a loading which is equal to the sum of the light weight of the car body above the truck bolsters plus the rated capacity of the car increased by 10 per cent, which is usually considered to be the bolster design load, plus an amount equal to 50 per cent of the sum of these two amounts which is added to compensate for impact. A specification drawn up in this form is equivalent to one in which the 50 per cent overload provided for impact is omitted and the limiting value of the fibre stress is specified to be 10,000 lb. per square inch. In fact, this specification is in reality almost identical with the specification quoted in Example 1, with the exception that in the latter case the design load is a specified amount and is not estimated for each individual design of bolster. A design load of 68,500 lb. is quite often specified for a 50-ton capacity truck bolster.

In Example 4, the fibre stress is limited to 9,000 lb. per square inch and the direct vertical load, by which is implied the center plate load, as explained in paragraph (A), is specified to be 73,000 lb. instead of 72,000 lb. as in Example 1. A vertical eccentric loading such as the one described in paragraph (B), in which one-half the total vertical load is assumed to act at the center plate and the balance at either side bearing, requires that the bolster be designed for greater strength near the side bearings, as will

be explained more in detail later on. The transverse load is now quite commonly specified, requiring 50 per cent of the calculated vertical strength, some railroads requiring even higher values, but as the transverse strength or test requirements all specify a load at center only with supports at the centers of the columns, this phase of the subject is not as important and will not be considered at such length as the vertical.

A number of bending moment diagrams for various types of loading are reproduced in Fig. 1. Throughout the article all values of bending moment are expressed in inch pounds. On account of lack of space, the words "inch pounds" or their abbreviation are omitted in the diagrams. The first diagram represents the system of loading provided for in the specification of Example 1 with the exception that a load of 73,000 lb. is used instead of a load of 72,000 lb. As the loads usually specified range from 68,500 lb. to 73,000 lb. for convenience in making comparisons of the different methods a normal load of 73,000 lb. will be used. The second diagram is similar in all respects to the first diagram, with the exception that it is based upon a load equal in amount to but one-half the load, or 36,500 lb. As in the first case, it is assumed to act at the center. In the third diagram also, the load is equal to but one-half the original load, but instead of acting at the center of the bolster, it is assumed to act at the center of the left side bearing or at a distance of 13½ in. from the left support. The fourth diagram represents the system of loading specified in case (B) of the specification of Example 4, which requires that the bolster be designed for a load concentrated equally on the center plate and on one side bearing. It will be readily apparent that this diagram is in reality, the algebraic sum of the second and third diagrams. The fifth diagram of Fig. 1 is the maximum moment diagram for the combined loadings specified in case (A) and case (B) of Example 4, which were shown graphically in the first and fourth diagrams. In designing bolsters to meet the requirements of a specification of the type illustrated in Example 4, the maximum moment as indicated by the lower heavy line in the fifth diagram must be used.

Reference to this line will bring out the fact that the bending moment at the side bearing increases from a value of 492,750 in.-lb. for the case in which the load is concentrated at the center plate, to a value of 652,734 in.-lb. for the case in which one-half the load is assumed to act at the side bearing and the other half at the center plate, or in other words, in the latter case the bending moment at the side bearing is 132 per cent of that resulting from the normal bending moment due to the concentration of the entire load at the center plate. The area of the small triangle readily illustrates the change in the bending moment diagram for a concentrated load acting at the center plate, which is brought about by this assumed double system of loading.

It will be recognized that this diagram is complete but for that half of the load which acts at the left side bearing only. Were the other half of the load assumed to act at the right side bearing and the diagram completed, it would be symmetrical. In working up a bending moment diagram, it is much more convenient to consider but one side only—in fact, by using the value of 246,377 in.-lb., which is shown at the center of the third diagram, it is only necessary to lay out construction lines for one-half the length. This method is followed in diagrams 6 and 7 and the moment diagrams which follow. A diagram is not absolutely essential, but it provides a ready means of ascertaining just what parts of curves 1 and 4 enter into the construction of curve 5. It is absolutely necessary that the maximum value of the moment, whether it be of curve 1 or 4, be used if it is desired that the design meet the requirements of the specification cited in Example 4.

In the first five diagrams of Fig. 1, the spread of the side bearings was assumed to be 50 in., or 4 ft. 2 in. The last diagram of Fig. 1 is in reality two distinct diagrams, each having a different spacing of side bearings—on the left half of the diagram, designated as No. 6, the spread of the side bearings is 60 in., or 5 ft. 0 in., while for the right half of the diagram, designated as No. 7, the side bearings are spaced 64 in., or 5 ft. 4 in. apart. The heavy line indicated by the figures 6 and 7, respectively, defines the maximum bending moment for a system of loading wherein on the one hand one-half of a load of 73,000 lb. acts at the center plate, and the other half acts at the side bearing, and on the other hand, the entire load of 73,000 lb. is concentrated at the center plate. Considering the

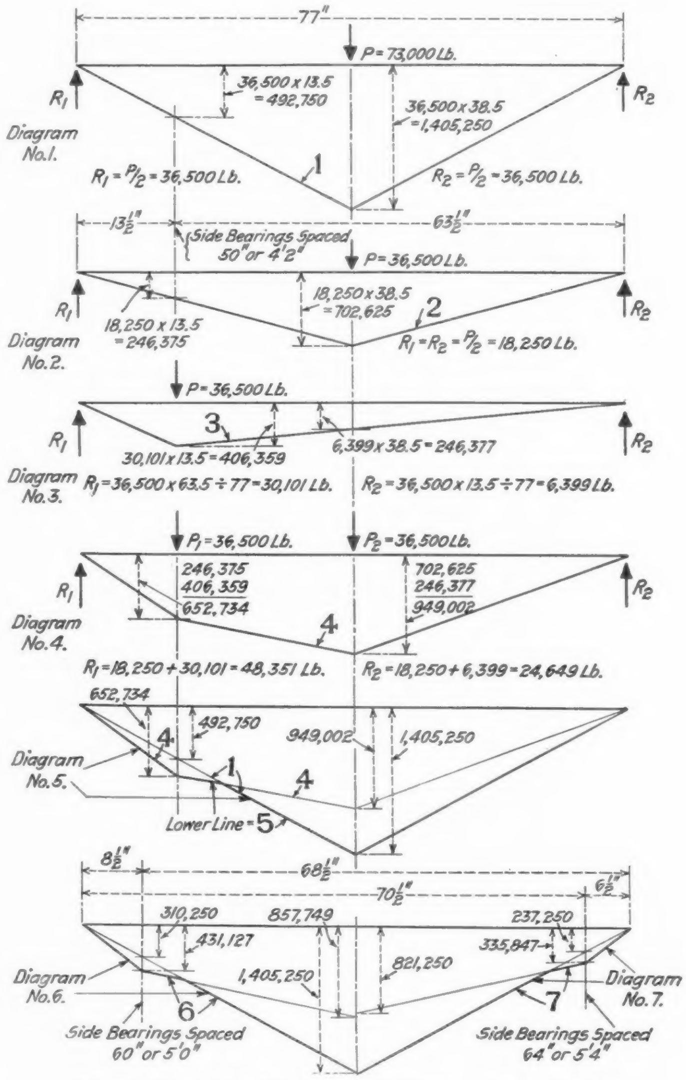


Fig. 1—Seven Bending Moment Diagrams for Varying Bolster Loads

bending moment at the side bearing due to a load concentrated at the center plate as 100 per cent, the bending moment when one-half the load acts at the side bearing and the other half at the center plate attains a value of 139 per cent and 142 per cent for these two cases respectively, whereas it was 132 per cent for the case in which the side bearing spacing was 50 in. or 4 ft. 2 in.

The reason why the maximum bending moment at the side bearings increases in proportion as the spread of the side bearings is increased, becomes readily apparent when we recall the fact that one-half of the total load was assumed to act at either side bearing, irrespective of how far apart they were spaced.

Bending moment diagrams have now been developed for specifications which call for a system of loading wherein the entire load is concentrated at the bolster center plate and also for those specifications which provide that the load shall be concentrated at the center plate or divided equally between the center plate and one side bearing. With respect to the latter case, three different side bearing spacings have been used in order to bring out the effect upon the bending moment due to differences in the spread of the side bearings, and to emphasize this point as regards its effect upon the form of diagrams 5, 6 and 7, and to provide for a ready comparison, all three diagrams have been reproduced in Fig. 2.

Another type of bolster specification is one in which it is required that the bolster shall be designed for a certain given section modulus (Z). The formula given in Fig. 3 and developed by W. F. Kiesel, Jr., assistant mechanical engineer of the Pennsylvania, represents an example of this method. Although this formula, in the form in which it is presented does not take into account the spacing of the side bearings, bolsters so designed have a greater relative section modulus near their ends than would be the case were they designed to the first diagram of Fig. 1. This formula as given is based upon a fibre stress at the center of 12,500 lb. per square inch. In order to demonstrate how a bending moment diagram constructed according to this method compares in a general way with the diagrams 1, 5, 6 and 7, the bending moment as called for by this equation is plotted as curve 8 in Fig. 2, the other diagrams being a series of straight lines. It is to be borne in mind, however, that the maximum value of the fibre stress used with diagrams 1, 5, 6 and 7 range from 9,000 to 12,000 lb. per square inch, usually 9,000 or 10,000 for tension and 11,000 or 12,000 for compression being specified, although some specifications provide that the maximum values of tension and compression shall be equal in amount, that is, not over 9,000 for either tension or compression.

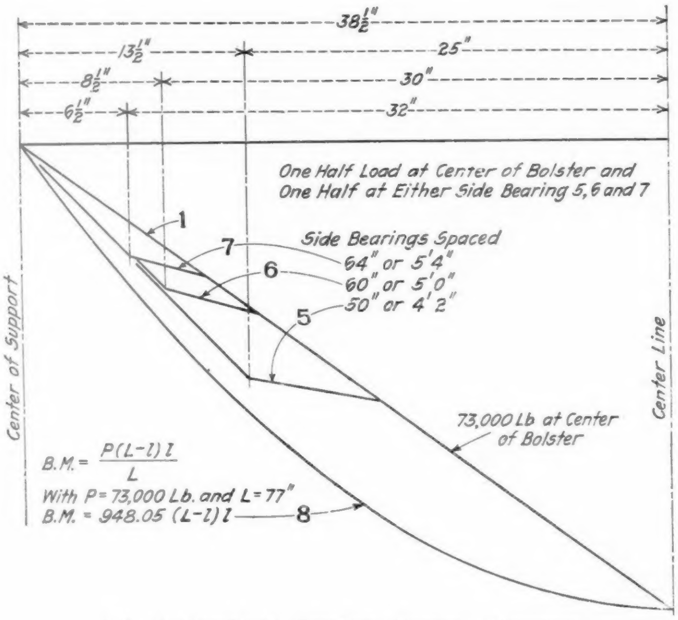


Fig. 2—Combined Bending Moment Diagrams

In order to provide a ready comparison of all the various methods employed in the design of bolsters, the section moduli as determined from diagrams 1, 5, 6 and 7, based upon a fibre stress of 9,000 lb. per square inch, are plotted in Fig. 3, together with that used in connection with the formula just presented. It is evident that the diagram developed from the formula, in which a value of 12,500 lb. is employed for the fibre stress, approximates very closely to the requirements at the side bearings of diagrams 5, 6 and 7, but provides for a considerably smaller value of section modulus for that section of the bolster included between its center line and a point located about 24 in. from the support, i. e., it provides for a section modulus of 112.4 at the center of the bolster as compared with 156.0 for either of the diagrams 1, 5, 6 or 7. That portion of the diagrams which is based upon an assumption that one half the load acts at the center plate and the other half at the side bearing, and which gives a smaller section modulus than that resulting from a load concentrated at the center plate, is shown by dotted lines. The greater value of the section modulus corresponding to the maximum bending moment should be used and these values are indicated by the full lines.

It has been quite generally the practice heretofore to employ in the design of bolsters the method outlined in Example 1 and also shown as one in Figs. 2 and 3, but due to the fact that the large percentage of bolster failures occurred in the vicinity of the side bearings or ends, and influenced by the investigations as to the action of the forces, the practice of designing bolsters according to the requirements of specifications such as the one cited in Example 4 and illustrated by diagram 8 of Fig. 2, has in most cases been adopted by designers and one or the other of these two methods is now usually specified.

Assuming a horizontal force equal in amount to 0.4 of the vertical load W to act 72 in. or 6 ft. above the rail, in accordance with the practice followed in designing M. C. B. axles, it is evident that the reaction at the side bearing, due

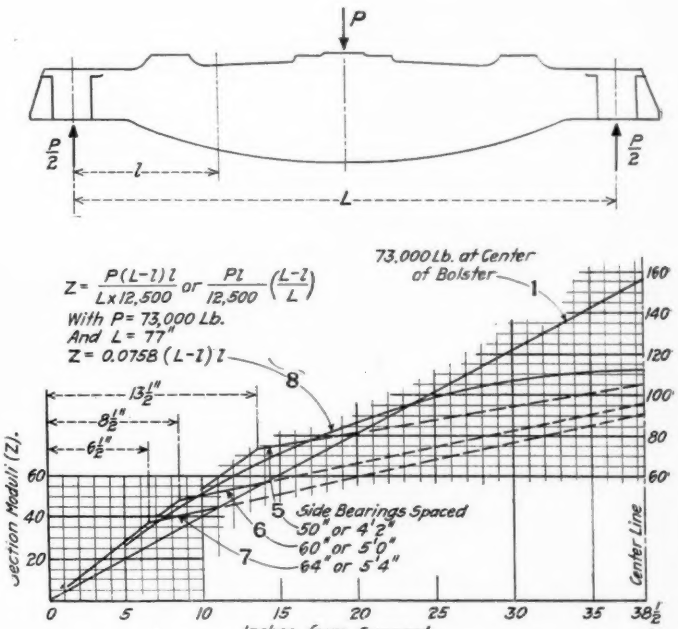


Fig. 3—Section Modulus Curve

to this action, would depend upon the side bearing arm; that is, the distance from the center of the side bearing to the center of the bolster. With a center plate bearing located 26 in. above the top of the rail, the arm of the horizontal force would be 72 in. minus 26 in. or 46 in. as compared to a side bearing arm of 25 in., 30 in. and 32 in. for side bearings having a spread of 50 in., 60 in. and 64 in. respectively, as was the case in the diagrams of Fig. 1 and the resultant side bearing reactions in terms of W would become $0.736W$, $0.613W$ and $0.575W$ respectively. For a center plate load of W equal to 73,000 lb., the numerical value of the reactions at the side bearings becomes 53,728 lb., 44,773 lb. and 41,975 lb. These amounts are shown just

above the arrowheads at the location of the side bearings at the left of each of the three diagrams in Fig. 4.

When a load comes on either side bearing due to the action of a horizontal force, there are in addition to the two equal reactions at the bolster spring seats resulting from the 73,000 lb. load at the center bearing, reactions occurring at each spring seat, the maximum reaction due to the side bearing load being at the spring bearing adjacent to the loaded side bearing. In case the side bearing arm is equal to or greater than one-half the distance between the bolster spring seats, the horizontal force might be just sufficient to cause the maximum reaction to equal the tilting force, in which case the other reaction due to this force would equal zero. Any increase in the horizontal force above this amount would cause a negative reaction at the spring seat opposite the loaded side bearing end. However, the spread of the side bearings in all three of our assumed spacings is such as to cause a positive reaction at each spring seat for the action due to the horizontal force alone, irrespective of its amount.

Based upon the same assumption that a horizontal force equal in amount to 0.4 of the vertical load, acting at a point 72 in. above the rail, the bolster reactions, due to the reactions at the side bearing as determined in the preceding paragraph as well as the bolster reactions due to the direct vertical load, are also noted at the lower right and left hand corners of each of the diagrams of Fig. 4. These reactions

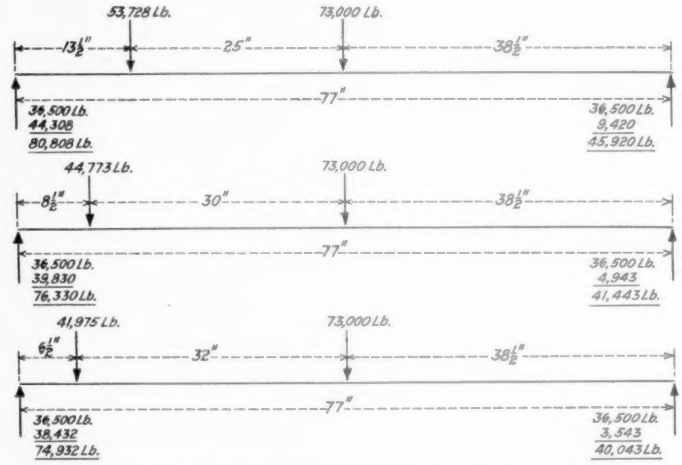


Fig. 4—Diagrams Showing the Reactions Due to Combined Vertical and Horizontal Forces

were determined, of course, by considering the bolster as a single beam supported at the ends, and carrying a single concentrated load. Thus in the group of figures in the lower left hand corner of the upper diagram, the value of 36,500 lb. represents the reaction at the left support due to the concentrated load of 73,000 lb. acting at the center of the bolster, (i. e. center plate load). Similarly, the value of 44,308 lb. represents the reaction at the left support due to a load of 53,728 lb. acting at the left side bearing (i. e. side bearing reaction determined in preceding paragraph) and it is determined by multiplying this load by its moment arm about the right point of support and dividing the sum by the distance between the two points of support, thus:

$$53{,}728 \times 63.5 \div 77 = 44{,}308 \text{ lb.}$$

The maximum bolster reaction at the left point of support is equal to the sum of these two reactions or 80,808 lb., an amount which is 221 per cent of the normal reaction of 36,500 lb., due to the direct static load of 73,000 lb. acting at the bolster center plate. Similarly, the maximum bolster reactions at the left for each of the other diagrams will be found to be 76,330 lb. and 74,932 lb., which amounts in terms of per cent of the normal reaction, are 209 per cent and 205 per cent respectively.

The figures at the lower right hand corner of the diagrams represent the bolster reactions at the right point of support corresponding to the bolster reactions at the left point of support as determined above. These reactions at the right point of support are minimum reactions for this condition of loading and will be found to be 12.6 per cent. 113 per cent and 110 per cent respectively, of the normal

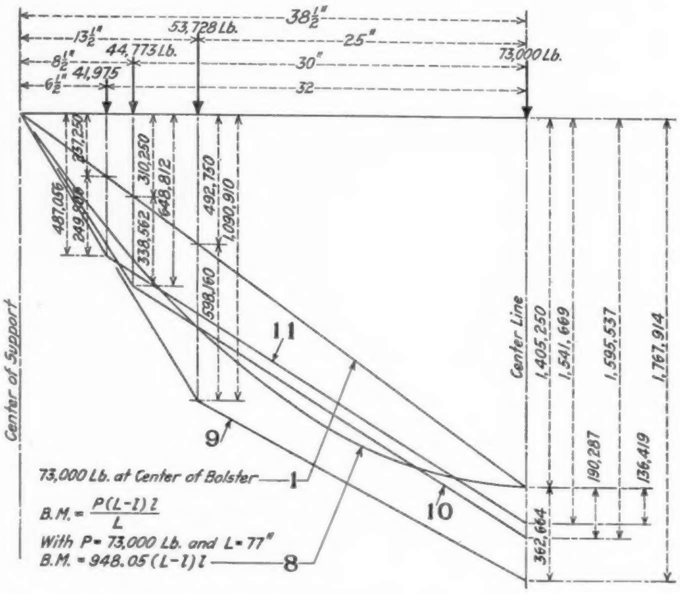


Fig. 5—Diagram of Bending Moments Due to Combined Vertical and Horizontal Forces

reaction of 36,500 lb., due to the direct static load of 73,000 lb. acting at the bolster center plate.

Were the horizontal load assumed to act in the opposite direction, or towards the right, these reactions at the right and left points of support would be merely transformed, i. e., the maximum reaction would occur at the right support and the minimum at the left support. According to the method of loading outlined in Example 4, (A) and (B), and illustrated by the fifth diagram of Fig. 1, the maximum

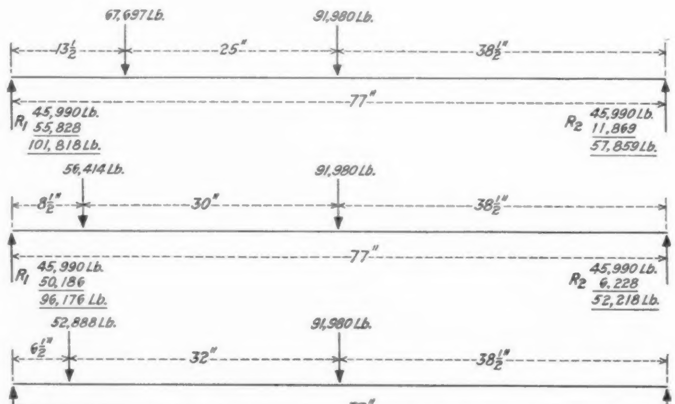


Fig. 6—Diagrams of Reactions Due to Horizontal Forces Plus Vertical Forces Increased 26 Per Cent for Vertical Impact

reaction for the bolster having a spread of side bearings of 50 in. will be found to be 48,351 lb. or 132 per cent of the normal reaction, due to the direct load acting at the center plate, this being the reaction adjacent to the side bearing which carries one-half the vertical load. Were such a condition to actually occur in service, the reaction at the other end of the bolster would be 24,649 lb. or 68 per cent

of the normal reaction, as indicated at the right of diagram 4, Fig. 1 and at the top of Table I. As mentioned above, in designing bolsters according to this method, the process is shortened by making use of a moment diagram similar to that part of diagram 5, Fig. 1 to the left of the center line for both ends of the bolster.

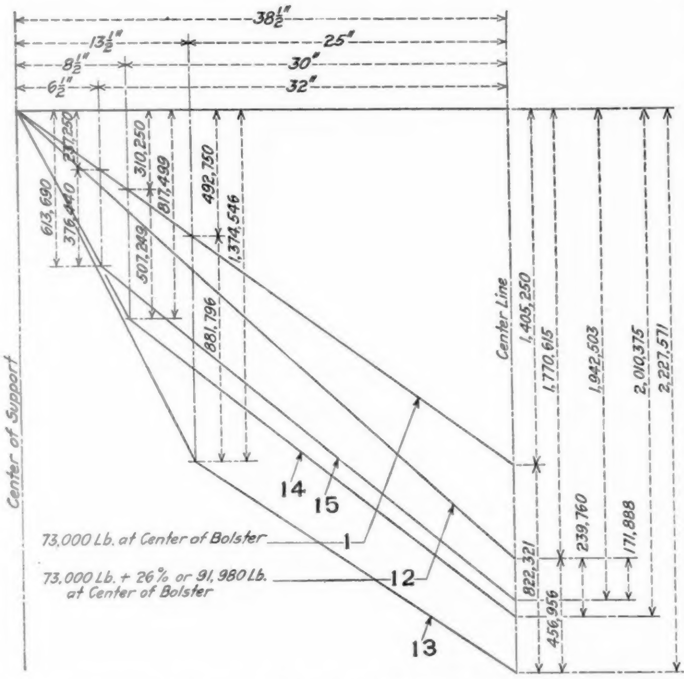


Fig. 7—Bending Moment Diagram With 91980-Lb. Center Plate Load

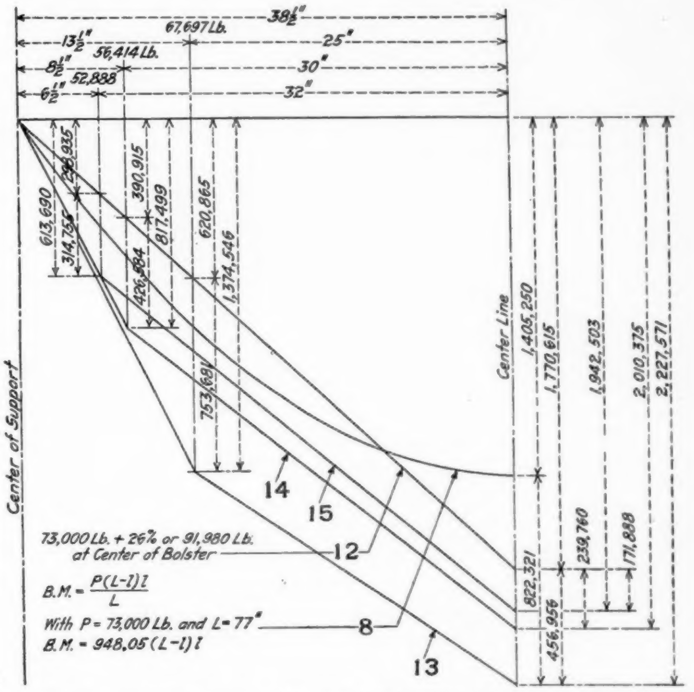


Fig. 8—Bending Moment Diagram With 73000-Lb. Center Plate Load

In constructing the bending moment diagrams of Fig. 5, the direct load W acting at the center plate was taken as 73,000 lb. and the horizontal force H assumed to act 72 in. above the rail, equal to $0.4W$ or 29,200 lb. In making their recommendations as to the loads to be employed in the design of axles, the Master Car Builders Association committee (see proceedings of 1896) determined the weight W by adding to the weight of the car body, trucks and lading, 10 per cent additional lading for refrigerator cars and 20 per cent additional lading for gondola cars, the weight of the wheels and axles not entering into the calculation. In regard to the per cent overload recommended the report stated: "The usual overload is 10 per cent, but there are cases where bulky material, such as coal and iron ore, when loaded in cars, is not evenly distributed between the two trucks; and cases are known where trucks have been loaded under these circumstances to at least 20 per cent more than their designed capacity." As regards the load the axle was designed to carry, they state: "The axle recommended by your committee is therefore designed to carry 31,000 lb., including body, trucks and loading. It should be distinctly understood that the axle recommended is to carry this weight, as the sum of the weights of the car body and trucks and lading when using 33-in. wheels."

In Fig. 5, in addition to the bending moment diagrams 9, 10 and 11, for combined vertical or center bearing load of 73,000 lb. and the horizontal load equal to 0.4 of the vertical load, diagram 1 is also drawn for the 73,000-lb. vertical center load.

The bending moment curve as adopted from the formula of Fig. 3 is represented by diagram 8. The forces at the three side bearing spacings, viz., 53,728 lb., 44,773 lb. and 41,975 lb. respectively, are indicated on the drawing, but it should be borne in mind that only one of these applies to each diagram, the three being shown merely to give a convenient comparison. The increase in bending moment at the side bearing and at the center for the 0.4 horizontal force as compared to the vertical central load of 73,000 lb.,

TABLE I.—VERTICAL REACTIONS AT BOLSTER SUPPORTS FOR THREE CONDITIONS OF LOADING. THE TOTAL REACTION AT EACH SUPPORT IS GIVEN IN PER CENT OF THE NORMAL REACTION OF 36,500 LB.

		SIDE BEARING SPACING					
		50 in. or 4 ft. 2 in.		60 in. or 5 ft. 0 in.		64 in. or 5 ft. 4 in.	
Line No.	Amount and method of loading	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
1	73,000 lb. load vertical ½ at center and ½ at either side bearing	48,351 lb. 132 per cent	24,649 lb. 68 per cent	50,721 lb. 139 per cent	22,279 lb. 61 per cent	51,669 lb. 142 per cent	21,331 lb. 58 per cent
2	73,000 lb. load vertical with horizontal load = .4 of vertical or 29,200 lb.	80,808 lb. 221 per cent	45,920 lb. 126 per cent	76,330 lb. 209 per cent	41,443 lb. 114 per cent	74,932 lb. 205 per cent	40,043 lb. 110 per cent
3	73,000 lb. + 26 per cent, or 91,980 lb. vertical with horizontal load = .4 of vertical or 36,792 lb.	101,818 lb. 279 per cent	57,859 lb. 159 per cent	96,176 lb. 263 per cent	52,218 lb. 143 per cent	94,414 lb. 259 per cent	50,450 lb. 138 per cent

TABLE II.—COMPARISON OF BENDING MOMENTS AT SIDE BEARINGS AND CENTER FOR VARIOUS LOADINGS. ALL VALUES GIVEN IN PER CENT OF NORMAL BENDING MOMENT OR THAT DUE TO A CENTRAL LOAD OF 73,000 LB.

		SIDE BEARING SPACING					
		50 in. or 4 ft. 2 in.		60 in. or 5 ft. 0 in.		64 in. or 5 ft. 4 in.	
Line No.	Amount and method of loading	Side bearing	Center	Side bearing	Center	Side bearing	Center
1	73,000 lb. at center or one-half at center and one-half at either side bearing	132 per cent	None	139 per cent	None	142 per cent	None
2	73,000 lb. at center with horizontal force = .4 of vertical or 29,200 pounds	221 per cent	126 per cent	209 per cent	114 per cent	205 per cent	110 per cent
3	73,000 lb. + 26 per cent or 91,980 lb. at center with horizontal force = .4 of vertical or 36,792 lb.	279 per cent	159 per cent	263 per cent	143 per cent	259 per cent	138 per cent

is denoted in Fig. 5 and tabulated in Table II, line 2. In Table I, the reactions, for this loading, are given in line 2 for the three side bearing spacings and also in per cents of the normal reaction of 36,500 lb.

In Figs. 7 and 8, a series of bending moment diagrams are plotted in accordance with the same method of loading used in laying out the diagrams of Fig. 5, with the exception that the original assumed center plate load of 73,000 lb. was increased 26 per cent or 18,980 lb. in order to compensate for vertical impact, thus making the center plate load 91,980 lb. The value of the horizontal force is assumed to be equal to 0.4 of the center plate load as before, consequently it has been increased in amount in proportion to the center plate load. The numerical value of the various loads and reactions for these diagrams are listed in Fig. 6, diagrams 12, 13, 14 and 15 are reproduced in both Figs. 7 and 8.

In Fig. 7, the first diagram of Fig. 1, which is the bending moment diagram for a single concentrated load of 73,000 lb. acting at the bolster center plate, is reproduced (see diagram marked 1) in order that it might readily be compared with diagrams 13, 14 and 15, which are the bending moment diagrams for the three locations of side bearings based upon a center plate load of 91,980 lb. together with the horizontal load equal to .4*H*. The bending moment diagram (see diagram marked 12) for a single concentrated load of 91,980 lb. acting at the center plate is also included in Fig. 7.

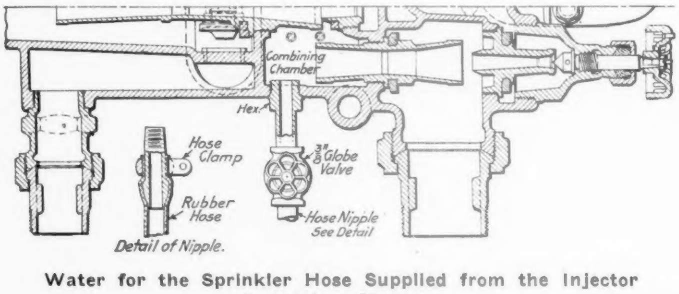
In Fig. 8 these three diagrams for the various bearing spacings are reproduced in order to compare them with the bending moment diagram drawn in for the 91,980 lb. central load. The bending moment (curve 8) for the formula of Fig. 3 is also reproduced in Fig. 8 for convenience in drawing comparisons.

The vertical reactions at the bolster supports due to this center plate load of 91,980 lb. are tabulated in line 3 of Table I, for each of the three locations of side bearings. Corresponding bending moments in percentage of the normal bending moment or that due to the original assumed center plate load of 73,000 lb. are tabulated in line 3 of Table II.

(To be continued.)

A NEW SPRINKLER ARRANGEMENT

To overcome the inconvenience caused by coal dust, it is common practice to wet down the coal on a tender by means of a sprinkler hose piped to the injector or delivery pipe and when the injector is working, the fireman can use the hose to throw a stream of water back over the tender. The objection to this method lies in the danger of scalding the fireman and a simple way of preventing such



Water for the Sprinkler Hose Supplied from the Injector Combining Chamber

accidents has been suggested and applied to Boston & Maine locomotives. Obviously, if the sprinkler hose is piped to the forcer combining chamber or delivery pipe, it can supply only hot water and steam at the temperature at which it enters the boiler. If, on the other hand, it is piped to the lifter combining chamber, where the water has just come from the tank, comparatively cool water will be supplied and this is the arrangement recommended by the Boston & Maine.

The accompanying illustration shows the position of the lifter combining chamber with the hose nipple tapped into it. The globe valve and hose clamp are also shown.

In some inspirators there is a 3/8-in. clean out plug tapped into the lifter combining chamber and in this case it is very simple to remove the plug and screw in the hose nipple. In case there is no clean out plug, it is simple necessary to drill the inspirator through the lifter combining chamber wall and tap out the hole with a 3/8-in. pipe tap.

To operate the sprinkler, the globe valve is opened and the inspirator handle pulled back to the priming position. The water is thereby forced out through the sprinkler connection with velocity enough to throw it 25 or 30 ft. There is some waste at the overflow, but not in sufficient quantity to be considered. Owing to the small volume of steam required to lift the water, the temperature is not raised much above 100 deg. F., thereby preventing scalding accidents. This arrangement cannot be applied to inspirators which do not have the combining chamber feature.

BACK UP THE BOYS AT THE FRONT BY WORK!*

BY S. SKIDMORE
General Foreman Car Repairs, Big Four, Cincinnati, Ohio

Listening to some of the remarks in regard to what the railroads are doing and should do to help win this war, a serious thought has come to me. I see a great many troop trains passing by, with the flower of this country, carrying them we don't know where, going to do their bit—even sacrifice their lives for this country if necessary, and then I have some doubts we stay-at-homes are doing our duty to help win the war.

We all know it is going to take an enormous amount of supplies to win this war, as well as men. I pick up the paper and almost daily I see where the stay-at-homes are going to cut down the production by working shorter hours, I don't know whether it is intentional or not, but they are advocating shorter hours continually, when at this time they should be working longer hours and giving more production instead of less.

It is not the proper time to advocate a less production and less hours work. We should be working more hours, producing everything we can to win this war.

We are all handing out our bit and we stay-at-homes should do that without stint instead of trying to give as little as possible and get out of it all possible. It is the wrong time to advocate the eight-hour principle.

If we had an over-supply of labor it would be all right, but we find now that the labor supply is very scarce. I think if the stay-at-homes would just stop advocating shorter hours until the war is over then they would help save all of our friends in the trenches. No one should object to doing that when we see our fellow-workers giving up their all to fight our battles.

SALE OF BORINGS AND TURNINGS BY SOUTHERN PACIFIC.—The Southern Pacific reports that $22,000 worth of borings and turnings from machine tools were collected and sold from its shops in 1917, yielding about $1,900 a month. Over a million dollars' worth of scrap materials of all kinds were sold on the Pacific system in 1917 and a much larger amount was reclaimed for new uses.

*Taken from the proceedings of the Cincinnati Railway Club.

FIREBOX REPAIRS*

BY GEORGE AUSTIN
General Inspector Boilers, Atchison, Topeka & Santa Fe

Acetylene and electric welding are rapidly bringing about a complete revolution in firebox repairs. Either process has its own particular field to which it seems better adapted than others, though with either process a good operator will weld anything in a firebox. There is no trouble with half or whole sheets or small parts when contraction is amply provided for. When firebox patches are to be applied on parts where the elastic limit of the plate has been reached, which is indicated by small cracks near the patch being applied, do not weld them; a patch bolt patch leaves no contraction strains; it will need to be worked at times, but, will not cause a failure. Welding transverse cracks in the top flanges of back flue sheets has not been reliable. Welding side and door sheet cracks has been disappointing, except as a quick repair job. It may be that we will improve present methods, but at this time a strict regard for high standards and to prevent failures and the necessity of repairs, demands that welding patches and cracks in the fire-line of side or door sheets should be emergency or roundhouse jobs only. Conditions and experience will finally govern.

Piecing flues by the electric butt welding process is very attractive, because the flue is not wasted near or at the weld, in fact it is thicker. Second: there is no smoke or noise from welding fires, or trouble with bricking up furnaces. There is no heat used except when taking the heat and that is about twenty seconds to each flue. The process promises to become the standard method of piecing flues. We have about 200,000 of these welds in service and flue failures on account of bursting are not increasing.

Until some method is found that will keep the flue end clean and free from scale accumulation or some tool devised for knocking it off without disturbing the weld, welded flues in the back sheet will be disappointing. Where feed water carries considerable incrusting matter, the scale will form regardless of how the flue is applied and overheating is certain to follow and the weld or flue will break.

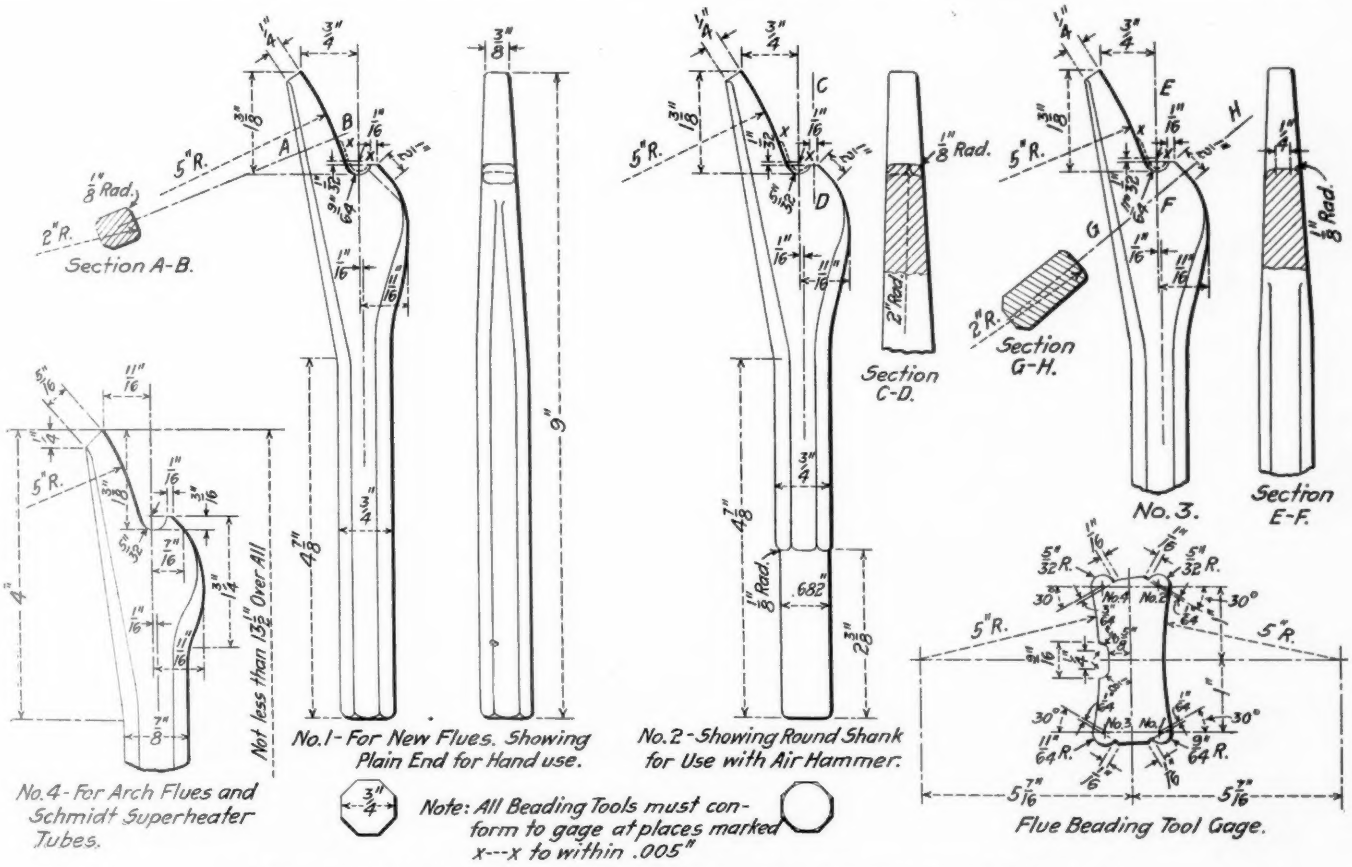


Fig. 1—Standard Flue Beading Tools and Gage for the Atchison, Topeka & Santa Fe

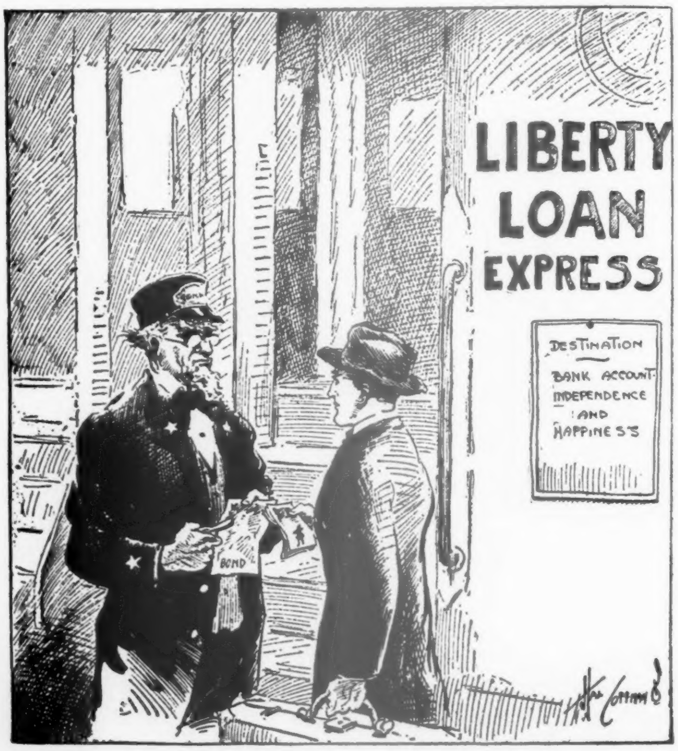
WORKING FLUES

Flue beads should be maintained small and compact, free from burrs of surplus metal, for the reason that excess metal exposed to the heat of a firebox absorbs heat in proportion

*From a paper presented before Western Railway Club.

to its area and bulk, and gets out of harmony with the other parts. The Santa Fe system of flue beading tools consists of four sizes, three for small flues, numbered 1, 2 and 3 and one larger size for superheater tubes, numbered 4. These tools come to us from the manufacturer drop forged and finished to gage with the gage number stamped in the side of each. All tools are repaired at Topeka shops; there is no exception to this. The flue beading tools and gage with dimensions of same, standard on the Santa Fe, are shown in Fig. 1. When flue beads get large for a No. 3 tool they are trimmed back to a No. 2. Every reasonable effort is made by the inspectors to keep these tools strictly to gage, and where this is done properly the flue beads will be kept small and compact.

Referring to incrustation on flues, staybolts and firebox sheets, the best tool for removing it from the flues at the sheet is the sectional or prosser expander. For setting flues when applying them we use sectional expanders from B. 9/16-in. deep for ½-in. sheet. For hot work or reworking after flues have been beaded, we use a ½-in. expander for a ½-in. sheet. This keeps the prosser groove hugging the sheet. We use a 3½-lb. hammer on hot work. We do not encourage the smooth type of expander and have very few in use. The prosser expander has been mentioned as being the best tool to jar the scale from the end of the flue on the water side. The objection to its use, is that it stretches the flue holes and distorts the flue sheet. Some light knocking tool should be designed that will work in the prosser groove and part of the flue in the flue sheet and not disturb the outside bead. In order to prevent breaking or splitting the flue at the prosser groove or breaking the bead or welded joint, the flue in the sheet will have to receive part of the blow. We help out large superheater tubes which in hard service give trouble, by applying a 3/16-in. or ¼-in. by 4-in. wide thimble of the diameter of the flue made from scrap steel or sheet iron. It is not welded. It is set with the butt joint at the bottom and held in place with a flat wedge of 12 or 16-in. gage iron driven between the flue and thimble at the top. The thimble absorbs some of the heat the flue end would otherwise get and relieves it from overheating to that extent. When one end of this thimble burns off, it can be reversed. It is believed welding the flues to the back sheet will be an improvement on that practice, but until we are fully equipped for welding, we are getting some help from applying these thimbles. With the above mentioned exception, superheater tubes are worked according to instructions recommended by the superheater manufacturers.

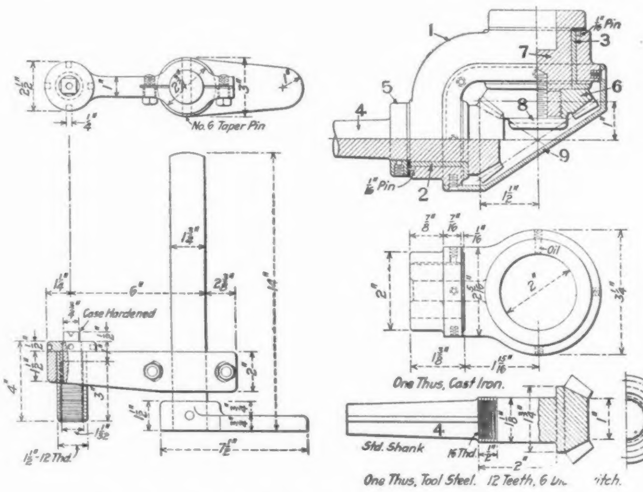


CLOSE QUARTER DRIVE AND OLD MAN

BY E. A. M.

The following description refers to a device used in reaming holes in close quarters at right angles, such as guide bolt holes, saddle bolt holes, etc. It was made in one of the large eastern railway repair shops and has given good satisfaction.

Referring to the illustration, 1 is the main casting, of which two views are shown. This casting has holes drilled at right angles to take the bushings 2 and 3, which are made of bronze. The driving shank 4, is a solid piece of steel machined at one end to make the bevel gear shown, and with the other end made into a standard shank to suit the air motor. The driving shank is a running fit in the bushing 2 and is held in place by the nut 5. A fibre washer goes between the shank and the casting and is pinned as indicated to keep it from turning.



Device Used in Reaming Holes at Right Angles

The bevel gear 6, which meshes with the driving shank gear is drilled and tapped to receive the reamer socket 7 and another fibre washer is placed between the socket and the casting.

The round head, left-handed set screw 8 screws into the reamer socket 7 and is tightened by means of a slot in the head. It is for the purpose of preventing the gear 6 from unscrewing, which would happen if the reamer got stuck and the motor was reversed.

Finally, to prevent the operator from catching his fingers in the gears, the guard 9 is fastened over them by means of 3/16-in. machine screws. Two oil holes are provided to insure proper lubrication.

In practice, the use of this close quarter drive has made it possible to ream many holes which otherwise would have had to be reamed by hand.

OLD MAN

In connection with the close quarter drive just described, an old man was developed which is also shown in the illustration. Its construction is evident and it serves the purpose of slowly forcing the reamer into the hole, being much better than the old way of using a plank and blocking on the engine frame or boiler.

Shop Scheduling on the B. R. & P.

Output of the Shop Has Been Materially Increased and the Burdens of Supervision Have Been Reduced

No better example of what a shop scheduling system can do in increasing the output of a shop can be found than on the Buffalo, Rochester & Pittsburgh. For the five months following the installation of this system at the Du Bois (Pa.) shops, the output was increased 25 per cent over the corresponding five months in the previous year and during this period 16 new fireboxes were applied as compared to 11 in 1916. This indicates that the work performed during 1917 was considerably heavier than that during the corresponding period in 1916. Further, the work was done with less than a five per cent increase in the total forces and in spite of the fact that approximately 80 trained men were lost on account of the draft and their places filled with men and women of lesser skill. In addition to this the system, together with action which prevented crowding the shop with locomotives, made it possible to decrease the average number of working days per locomotive by over 30 per cent. This of itself is a very important factor, particularly at this time when locomotives are so much in demand.

5 M 8-17

BUFFALO, ROCHESTER & PITTSBURGH RAILWAY COMPANY

MAINTENANCE OF EQUIPMENT DEPARTMENT

SCHEDULE FOR LOCOMOTIVE REPAIR WORK AT DU BOIS SHOPS

Engine No.________ Class of Repairs________ Assigned to Foreman________

GENERAL	SCHEDULED DAY	ACTUAL DAY	BLACKSMITH SHOP—Cont.	SCHEDULED DAY	ACTUAL DAY
Engine in Shop			Spring rigging to machine shop		
" off wheels			Brake " " " "		
Wheels to machines			Tank forgings to smith shop		
Engine stripped			" " " tank shop		
Jacket and Lagging removed over stay bolts			Frame binders closed		
Final inspection					
All material ordered			ERECTING SHOP		
New parts delivered to shop			Superheater units removed		
Parts to cleaning vats and returned			" " applied		
Frame, Wheels, etc., cleaned			Frames applied and bolting completed		
			Frame binders refitted		
BOILER AND TANK SHOP			Boiler lagged		
Boiler to boiler shop			Jacket applied		
Flues to flue shop			Steam and dry pipes completed		
" ready for boiler			Superheater work completed		
" applied to boiler			Cylinder work completed		
Fire box work completed			Valves applied complete		
Boiler ready for hydraulic test			Pistons " "		
Boiler returned to erecting shop			Guides and crossheads up		
Ash pan completed			Air pump, reservoir and air cylinders applied		
Grates applied			Shoes and wedges laid out and sent to machine		
Smoke box fixtures completed			Spring rigging applied		
Tank to tank shop			Running boards up		
Tank cistern completed			Cab on and floor applied		
Tank ready			Cab work completed and ready for test		
MACHINE SHOP			Driving boxes spotted on journals		
Wheels ready for engine tires and hub liners			Engine and trailer truck work completed		
Driving boxes to machines					
" box brasses to machine			Engine wheeled		
" " " pressed in boxes			Shoes, wedges and binders up		
" boxes ready for engine			Motion work erected		
Shoes and wedges planed to marks			Valves set		
Rocker boxes refitted			Rods completed		
Spring rigging to floor			Rods applied		
Brake rigging to floor			Brake rigging up		
Valves and pistons to machines			Hand rails up		
Valves ready for engine			Pipe work completed		
Pistons " " "			Lighting equipment applied complete		
Crosshead and guides to machines			Stoker repaired and applied		
Guides ready for engine			Front end and door on		
Crosshead ready for engine			Pilot beam and pilot applied		
Eccentric straps to machine			Couplers, levers, steps and grab irons applied		
" " " floor			Engine painted		
BLACKSMITH SHOP			Engine and tender out and coupled		
Frame to smith shop			Engine fired		
" " machine shop			Safety valve set		
" " engine			Air and steam heat completed and tested		
Rods to smith shop			Engine broken in or white leaded		
" returned to rod shop					
Brake and spring rigging to smith shop					
			Scheduling Supervisor		

Fig. 1—Schedule for the Locomotive Repair Work

During the five months period in 1916 referred to above, before the shop scheduling system was put into effect, 80 locomotives were repaired, each locomotive being held in the shop, an average of 38.7 days, making a total of 3,096 locomotive days. During the same months in 1917, after the shop scheduling system had been put into effect, 102 locomotives were repaired, each locomotive being held in the shop an average of 25.4 days, making a total of 2,591 engine days. These figures show that while 22 more locomotives were repaired under the shop scheduling system during the five months, there was a decrease of 505 engine days for engines held during that period. With locomotives worth at the present time $50 per day, this means a saving of $25,250 in the value of locomotives, and in addition to this 22 more locomotives were put through the hops. With the shop scheduling system it was possible to put the locomotives through the shop faster and with less delay, with the result that where an average number of approximately 27 locomotives were in shop in the five months in 1916, an average of only nineteen were in the shop during the corresponding five months in 1917.

A shop scheduling system permits of definitely laying out the work to be done on each locomotive well in advance of its going to the shop, of ordering and securing the material for the repairs, of fixing the time when each part of the work to be done on the locomotive should be completed and of arranging with each department for the completion of that work so there will be no delay between any of the various steps. Where this is done properly, each operation will be performed in logical sequence, which is particularly necessary in any railway shop. The figures above show what can be accomplished where such definite plans are laid. To put locomotives through a repair shop without a definite plan and schedule is like starting trains out of a terminal without despatching, train rules, orders or signals.

With no definite system in a shop a locomotive is often stripped before some of the necessary material is ordered. The locomotive is tied up while such new material is secured and prepared for application. It is impossible to properly plan for labor requirements and these are constantly being changed to the detriment of the various departments. The foremen and the general foreman have a great burden in that they act more or less as a clearing house and are constantly going from one department to another, as the occasion demands. There is a general lack of co-ordination between the different departments through no fault of their own perhaps,

BUFFALO, ROCHESTER & PITTSBURGH RAILWAY CO.

Du Bois, Pa., ____________19___.

EXPLANATION OF SHOP DELAYS

Eng.	Class repairs	Date Out	Operation	Date scheduled	Will be completed	Cause of delay

NOTE: Every operation not completed on date scheduled on Planning Sheet must be reported at once on this form to the Shop Superintendent, with detailed explanation of cause of failure.

________________ Despatcher.

Fig. 2—Form Showing Cause for Delays

but simply because without some plan or system their work will become congested.

Where a definite plan or system is followed, the shop is well advised as to the repairs to be made on the locomotive before it comes to the shop, arrangements are made in advance with the different departments for the work to be done, a date is set on which each sub-division of the work should be completed and the plans are so arranged that before the repairs are started on the locomotive it is seen that there will be no conflict with work to be done for other locomotives.

The system used on the B. R. & P., while not elaborate, is well defined. It was installed under the direction of H. C. Woodbridge, assistant to the general manager of that road. From four to six weeks before a locomotive is to be shopped, the local master mechanic or shop superintendent and road foremen of engines are required to advise the shop at which the repairs to the locomotives are to be made concerning the work which, so far as they know, will be required on the locomotive, directing attention particularly to such repairs as will require new material or machining, or extensive boiler work, etc. This report is given to the scheduling supervisor, who keeps a record of the date the new material is requisitioned from the stores department and adds to it the reports made by the locomotive inspectors as a locomotive reaches a shop.

For this work he has a large form ruled into small squares, the vertical columns representing the days of the month and the horizontal columns representing the different items shown in Fig. 1. By means of this form it is possible for the despatching supervisor to so plan the work of the shop that no one department will become congested. For instance, this form may indicate that two locomotives are to be wheeled on the tenth day of the month. The scheduling supervisor will, therefore, not schedule another engine to be wheeled on that day. This plan is followed on all of the principal operations. Having thus determined upon the dates for which the various parts shall be completed, a schedule for the repair work is made out for each engine on the form shown in Fig. 1, on which is shown the date on which a particular job is to be finished. This form is given to the various foremen throughout the shop.

BUFFALO, ROCHESTER & PITTSBURGH RAILWAY COMPANY
Maintenance of Equipment Department.

Du Bois, Pa.__________19__.

Mr. J.A.Morrow,
Division Storekeeper.

Dear Sir:

Below please find list of material required in shop and not on hand, this date.

Eng. No.	Material	Number Requested	Pattern Number

__________ Scheduling Supervisor

Copy to General Storekeeper.

Fig. 3—Form for Following Up Material Shortage

It is the duty of the scheduling supervisor to follow the work through the shop carefully and at the end of each day he checks up the work with the schedule, and when the work is done he fills in the date in the "actual day" column on his copy of the form referred to above. In case the work is not done according to schedule, a report is made to the shop

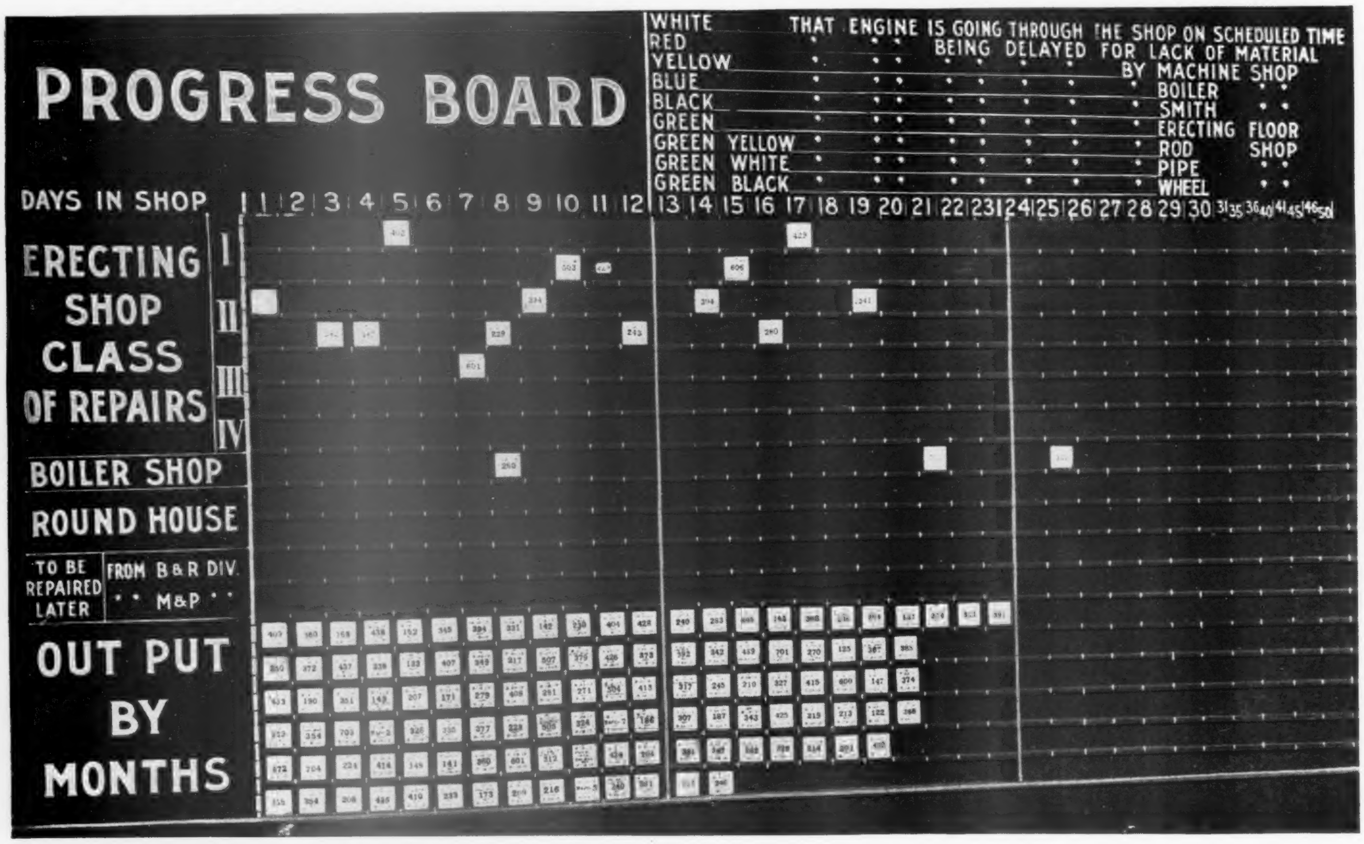


Fig. 4—Progress Board Showing the Condition of the Shop Work

superintendent with a detailed explanation of the cause of the delay on another form shown in Fig. 2, together with the information as to when the work will be completed. In this way the shop superintendent has a definite check on the work going through the shop and is thus advised definitely each day as to just what details require immediate attention in order that work may progress as planned.

The scheduling supervisor also watches closely the material required for repairs and is in constant touch with the local storekeeper. Another form, shown in Fig. 3, is filled out each day showing the material that should be in the shop, but which has not arrived. This is sent to the division storekeeper and a copy to the general storekeeper. This brings to the attention of the stores department the material that is urgently needed and gives them an opportunity of concentrating on it so that the output of the shop will not be interfered with. Such a system has worked to very good advantage at the Du Bois shops and the stores department is very anxious to obviate any delay where it is possible to do so.

A progress board, such as shown in Fig. 4, is maintained at the office of the general foreman, superintendent motive power and the general manager. This board contains racks in which are placed blocks or cubes having the numbers of the locomotives on them. A separate rack is provided for each class of repairs, boiler shop work, roundhouse work, etc. These racks are divided into days which show the number of days these locomotives have been in the shop; for instance, locomotive 606 is in the shop for class 1 repairs and has been in the shop 15 days. These cubes have different colored faces; the white face shows that the locomotive is going through the shop on schedule time, the red face shows that it is being delayed for lack of material, the yellow face shows that it is being delayed in the machine shop; blue, boiler shop; black, blacksmith shop; green, erecting shop; green and yellow, rod shop; green and white, pipe shop; green and black, wheel shop. The combination colors are applied by sticking yellow, white or black papers on the green side of the blocks. Thus the mechanical department officers can tell at a glance the condition of the shop and just why any locomotive is being delayed. The racks at the bottom of the board show the numbers of the locomotives that have gone through the shop by months, for the previous six months.

The results obtained from the installation of this scheduling system have fully justified its existence. The shop men are enthusiastic over it and it relieves the general foreman and the shop superintendent of a great deal of trouble. It gives them a much clearer idea of the performance and the workings of the shop than they ever had before. It gives them an opportunity to put their time on the larger questions of shop management and relieves them of a tremendous amount of detail work. Such a system, to be a success, must be directed by an able and wide-awake supervisor. He must be a man of a systematic nature, somewhat of a diplomat and one who is able to handle detail work. The success of the system at Du Bois is due to the fact that they have such a man in charge of the despatching, and to the full co-operation of everybody in the shop.

The War Savings Stamp Campaign.—A circular issued by the War Savings Stamp Trade News Committee states that for their respective first three months the American War Savings Stamp campaign is running ahead of the English campaign, a direct comparison showing that during this period England disposed of $11,293,000 of these securities and the United States $75,944,417—about $2,000,000 a day. The money already put at the service of the government by the buyers of War Savings securities has transferred from millions of citizens to the national treasury, command of the labor and materials to build a fleet of about one hundred 5,000-ton ships.

LABOR SAVING DEVICES ON THE SOUTHERN

BY J. O. JOHNSON
Foreman of Freight Car Repairs

The two devices briefly described in the following article were made for use in repairing cars on the Southern, and the slight cost of manufacturing them has been repaid many times by the saving in labor effected.

YOKE FOR REMOVING ELLIPTIC TRUCK SPRINGS

The yoke illustrated in Fig. 1 is made of 1-in. by 4-in. iron, with the ends bent in forging so they will hook in the pedestal

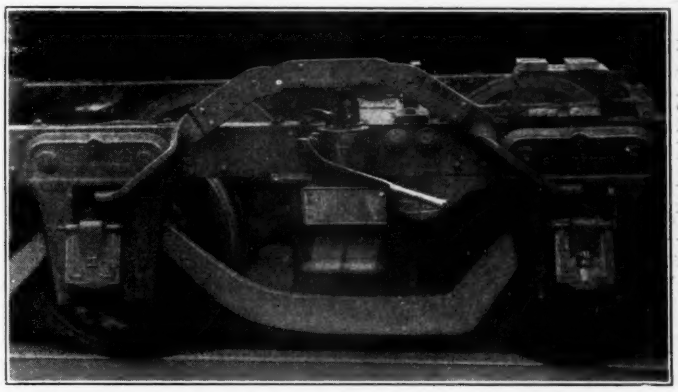


Fig. 1—Yoke for Use in Removing Elliptic Truck Springs

jaws. It is usually necessary to remove the side bearing, and the yoke when in place will extend above the truck bolster. A journal jack is placed between the yoke and the bolster and the elliptic springs compressed until a band of suitable size may be slipped on and hold the springs in compression. The jack may then be released and the springs easily removed. The band is made of ⅝-in. by 4-in. stock, and its size depends on the class of spring to be removed.

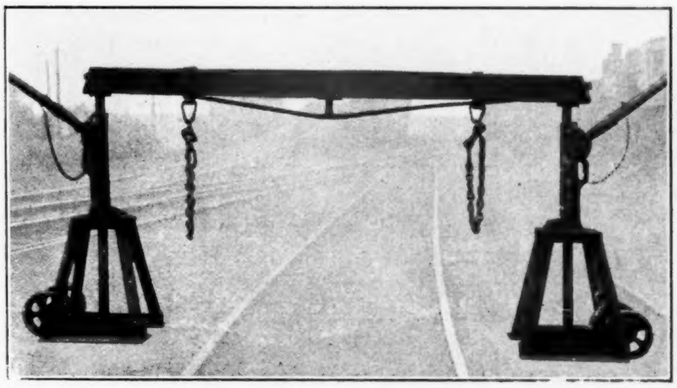


Fig. 2—Arrangement of Jacks for Use in Changing Truck Wheels

Elliptic springs may be removed by the use of this yoke without taking the truck from under the car.

JACKS FOR APPLYING PASSENGER CAR WHEELS

In removing the wheels from passenger car trucks, the old method of jacking and blocking up was not only slow but dangerous, and the arrangement shown in Fig. 2 was devised to remedy this condition.

Two 15-ton pump jacks were mounted on extension bases, as shown in Fig. 2, and the racks removed and replaced by longer ones, which would give a total lift of 48 in. The upper part of the racks in each case was provided with a jaw to hold one end of the reinforced cross beam. The chains shown are for the purpose of chaining up the trucks. Small

truck wheels attached to the lower end of the extension frames make it easier to move the jacks from place to place.

In operation, the truck ready to lift is run under the cross beam and chained to it. The truck is then jacked up and 48 in. will be found sufficient so that the wheels may be removed without interfering with either the brake beams or the hangers.

TWO VALUABLE HOSE DEVICES

BY E. S. NORTON

The New York, Chicago & St. Louis practice in renewing and clamping air hose is of special interest because two machines which were developed for the work have proved great time savers.

In pressing the coupling and nipple into the hose, a machine shown in Fig. 1 is used. It consists of a movable carriage *C*, mounted on a runway *DD*, consisting of two pieces of 5/8-in. by 1 1/2-in. iron, suitably bent and bolted to the bench. The carriage has a hinged cover or clamp which is securely held down by the taper wedge, as shown. At the left-hand end of the runway there is a block *E*, which is recessed to receive and hold the hose coupling. At the right end there is an 8-in. by 12-in. brake cylinder with a piston rod so arranged that the hose nipple will just slip on over the end and come up against the shoulder *F*.

The supply of air to and from the cylinder is controlled by the cutout cock, which has a release port drilled in the side. With the handle in one position this port is closed and air is admitted to the cylinder; with the handle in the other position, the air is shut off and that already in the cylinder is allowed to escape through the release port.

In operation the hose is placed in the carriage with an equal length projecting on either side, and is firmly held in place by the hinged clamp and tapered wedge. The air pressure is then applied, and as the piston is forced to the left, the nipple is pressed into the hose. A further travel of the piston moves the carriage to the left and forces the other end of the hose over the coupling. As a 4-in. travel of the

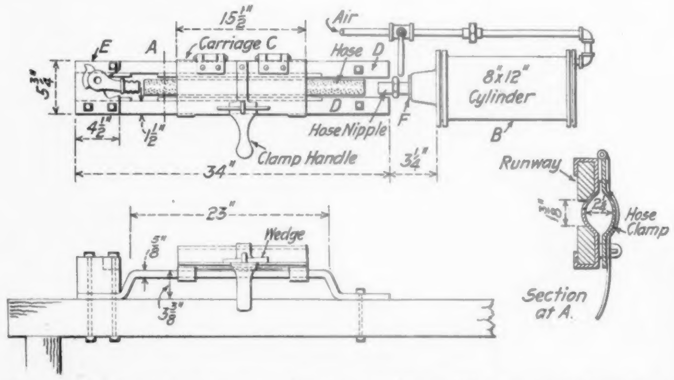


Fig. 1—Device Used in Pressing in Air Hose Nipples and Couplings

piston is sufficient for this work, a suitable block has been placed inside the cylinder to shorten the stroke. After the nipple and coupling have been pressed into an air hose, it goes to the next machine, which is conveniently located at the same bench and shown in Fig. 2.

This machine is used to press the hose clamps together and hold them while the bolts are being tightened. It consists of an 8-in. by 8-in. air cylinder *B*, mounted on two 4-in. by 6-in. sills, which are placed on the floor under the bench and securely bolted to it by the 5/8-in. rods shown. A metal crosspiece is screwed on the end of the piston rod and drilled and slotted at either side to receive the connecting arms *C* and suitable pins. The arms *C* are in turn connected to the levers *B*, which project up through two slots in the bench and are pivoted at the fulcrums *FF*. The upper ends of the levers are forged to form the jaws of the machine, and the fulcrums are reinforced by extra clamps to give greater rigidity. The supply of air to and from the brake cylinder is controlled by a cutout cock, as explained in Fig. 1.

It is obvious that with the arrangement and relative proportion of the arms and levers shown, an upward movement of the piston will result in the jaws of the machine coming together with considerable force.

In operation the hose and clamp are placed between the jaws, with the jaw points striking the offsets on the hose clamp. Air pressure is then applied, which results in press-

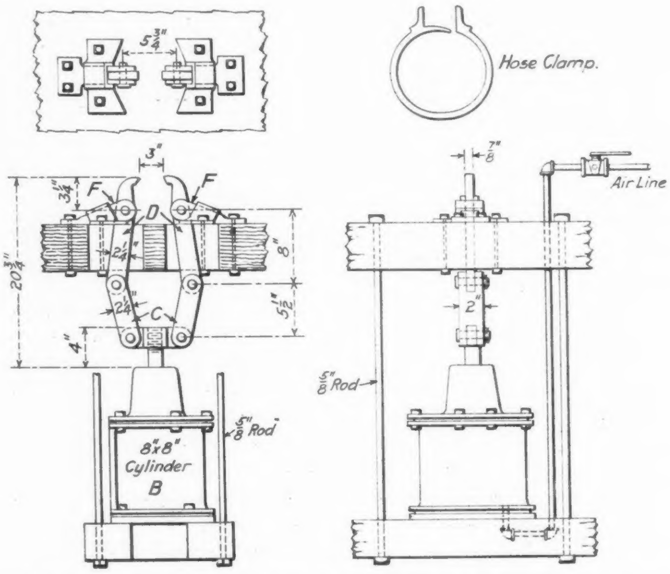
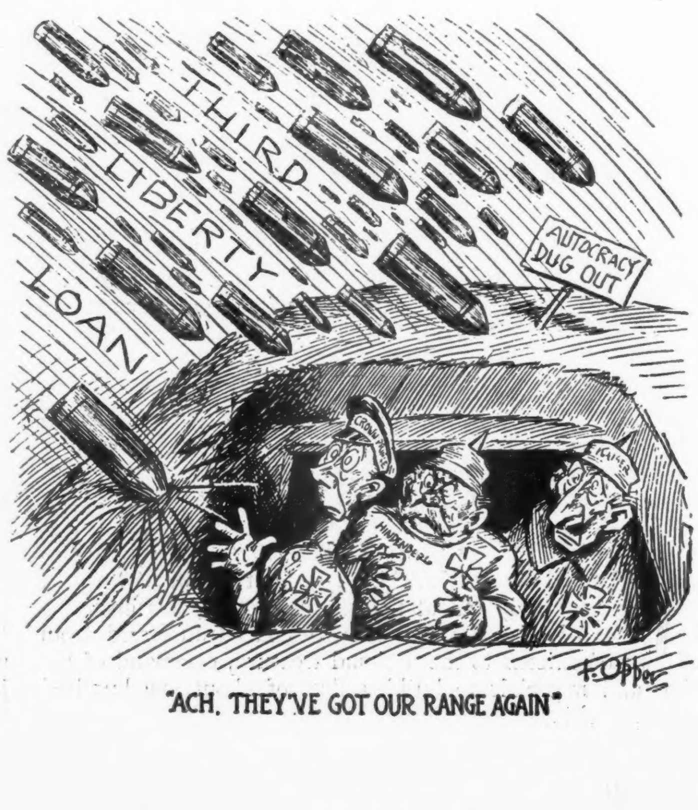


Fig. 2—Arrangement for Use in Clamping Air Hose to Coupling

ing the hose clamp together and holding it firmly around the hose while the bolt is being tightened. After the hose has been removed from the machine and the end of the bolt cut off, it is ready for service.

Both of the machines just described have proved valuable because of the reduction in the time required to fit up hose.



"ACH, THEY'VE GOT OUR RANGE AGAIN"

How Jack Wingate Secured a Raise

What Is the Matter with the Supervision in the Mechanical Department? Read the Answer Here

BY HARVEY DE WITT WOLCOMB

PHEW! It was the beginning of another hot day in August. As Jack Wingate, the general roundhouse foreman at Collins, wiped his face with a piece of waste, he wondered how much longer he could stand the terrific strain under which he was working.

Business was heavier than usual and in addition, the weather was hot, in fact had been so hot for the past two weeks, that over half his regular force was laying off, overcome with the heat, and on top of these extraordinary conditions he had so many new men to break in that he was nearly crazy trying to keep the big organization moving without a tie up. Such items as settling a strike about every morning or talking some gang into staying that had been on the point of walking out, had become a matter of routine with Jack.

It was known from one end of the road to the other that the gang that Jack Wingate couldn't handle did not exist. He was a man among men—a man who, while he worked for the interests of the railroad, appreciated the fact that his men had rights as well as the company. Therefore, while he was called a hard man, he was a fair and just one.

As he sat in his poorly lighted cubbyhole of an office, which looked like a big dry goods box tacked up against the side of the pretentious brick building used by the engineers and firemen as a rest room, he nervously noted the increasing pile of work reports which had not been attended to before the engines left the terminal. For these he knew that he was personally held responsible. He could imagine how the "Old Man" would "blow up" when the reports were put in on his desk, for the "Old Man" did not follow any of the details but "put it up to his supervision" to get results.

It surely was a mighty easy matter to make an inspection and find little jobs here and there which demanded attention before they developed into bigger jobs, but the hard part was to get time and men enough to cover all these little jobs.

The sun beating directly down on the low sloping roof of his office made the place so unbearable that Jack had to give up his half-hearted attempt to attend to his mail, and he started for the engine despatcher's office to "line up." As he passed the fire hydrant back of his office, his attention was unconsciously attracted to some bait fish that were being kept alive in an old trough by allowing a small stream of water to run on them and it seemed to him that even a fish led a more desirable life than a roundhouse foreman.

These bait fish had a history. At one time there had been a joke about them, but of late it had ceased to be a joke and no one mentioned bait fish.

Early in the spring, Jack had talked about going trout fishing for two or three days, for he felt that nothing would equal a few days' fishing to restore his energy and fighting spirit. Accordingly he had made great preparations; but one thing after another had come up until it was too late for trout, so he changed his plans to a day's outing at the lake.

One day early in July, the engineer on the work train had a good chance to get some nice minnows and had brought about one hundred of them to Jack, for he knew of his long planned fishing trip. Together they had fixed up a temporary place under this hydrant where running water could be kept on the bait; but just as in the case of his trout-fishing trip, Jack had been unable to get off. He had even had to work every Sunday since early spring. He still had his minnows but they stood a very good chance of becoming full grown fish before he could use them.

Continuing towards the engine despatcher's office he noticed some of his old men cleaning up the premises. Jack had the satisfaction to note that every man was working with a real interest in what he was doing. About two months before he had put in a request for a raise for these faithful old employees but the "Old Man" had "gone right up in the air" and would not for a minute consider a raise for these "old pensioners" as he called them. Jack had tried to show him that, while the men were getting well along in years, they had been in the service for many years and had learned the ways of handling things so well that even with their feeble efforts they actually produced more work and made a better showing for their labors than some of the green, fly-by-night men whom they were lately putting on. He had even showed where other companies were glad to get these faithful old men, giving them much more than the railroad was paying them, but the big boss would not for one minute consider a raise of any kind and the old fellows were gradually drifting away, making it all the harder to fill their places with trustworthy men—in fact, in many cases making it actually necessary to use two higher rated men to handle some job that was formerly handled by one of these faithful old timers. The "Old Man," however, would not give in and told Jack he didn't care if he used four men on one man's job, he would not retract from the stand he had taken. However, things had suddenly changed, for just the other day the "Old Man" had told Jack to make out forms for increases for the old men, and, to Jack's amazement, had actually used the very argument that he would not listen to some time ago when Jack wanted to hold the old timers by granting slight increases. The "Old Man" gave quite a lengthy talk on the reward for meritorious service, intimating to some extent that Jack had not been on his job or else they wouldn't have lost so many of the old timers and Jack had had an answer ready to prove that he had brought the subject up in plenty of time, in fact, at a time when a smaller increase would have kept the men, but on second thought he did not make any reply for the "Old Man" was the big boss and one couldn't hold him responsible for any mistakes. Jack had been a railroad man too long not to realize that it did no good to fight the boss and the only way to get even was to "pass the buck" along down the line.

As Jack entered the roundhouse, he felt so disgusted with his lot that he would have quit on very slight provocation. Here he was working his head off as you might say, neglecting his home and family, putting in long hours every day in the week, with no time for rest or recreation. While the law demanded that every working man should have at least one day of rest in every seven days, it did not consider that a foreman, who, although he did no manual labor, was the hardest working man about the plant, and should be entitled to the same privilege—and as yet the company had not even offered to raise his pay.

Jack's one fault was that he was a little too timid about his own personal interests, but when cornered could always put up a stiff fight for his men. He was one of those fellows who never put themselves forward but tend strictly to their own jobs. When any of the general officers visited the place, they always had to send for Jack, and as he was always on the job, they had learned to respect his ability and loyalty, but as Jack was not a "four-flusher," they soon forgot the quiet, well mannered, easy spoken man. Jack was not one

of those big "I" fellows and though he had been fighting for raises for his men for some time, he had said not one word about his own salary, feeling that his work ought to recommend itself.

As he entered the engine despatcher's office he overheard some engineers and firemen discussing their wages, and feeling a little out of sorts, he answered their greetings by telling them that it was about time they were satisfied with what they received and gave the poor shop man, who actually did the hard work, a show. "Well," retorted one of the engineers, "we are not like you, afraid to ask for our rights." Just at this moment something came up to distract Jack's attention, but the engineer's words kept running through Jack's mind all day. He couldn't get over the taunt and decided to hit the "Old Man" for an increase at the first opportunity. Although he had several good openings, he did not have the courage to come out flat-footed and demand a raise, but compromised by dropping a personal note asking that something be done towards granting him an increase. He felt guilty when he met the "Old Man" the next morning, but as nothing was said about increases, he soon forgot the incident and it ran along for a matter of over a month before he even remembered asking for a raise, and then the matter was again brought up to him very forcibly by receiving a nice offer for a better position with an industrial concern. After thinking the new offer over carefully, he decided to go to the "Old Man" for advice.

While he thought he had been a successful foreman for the past 15 years, working for the same company so that he knew their work and requirements probably better than the officers, he could hardly convince himself that some other company was willing to pay him $50.00 a month more to start in with them. He could not appreciate the fact that his ability in handling men and getting out the work was worth big money to any company during these difficult times, and that this in addition to his long training in locomotive repairs made him a very important and valuable addition to their supervising forces.

While Jack felt very backward about bringing up such a delicate matter to the "Old Man," he nevertheless realized it was the chance of a lifetime, so decided to seek advice from the "Old Man." When the "Old Man" heard about the offer, he slapped Jack on the back and told him to forget it for the company had his case under advisement and would certainly do something for him.

Actually feeling ashamed at having brought up the subject, he returned to his duties with renewed energy, expecting soon to receive a notice of his increase. However, the matter drifted along for two weeks more when one day the "Old Man" sent for Jack to come up to the office. After delivering a long talk on his past good record, telling him how much they appreciated his loyalty and ability, the "Old Man" closed his remarks by saying, "and I am now pleased to advise you that beginning with the first of next month you will receive a $5.00 increase in your monthly salary."

As Jack heard this, he suddenly felt old and lonely, and was beset by a depressing sense of failure. He, whose ability and personal efforts secured for the company an effective return approaching 100 cents on every dollar spent in wages at a busy engine terminal, had expected more than this.

Mechanically his thoughts drifted over the past, bringing to his mind many of the increases he had secured for his men, in some cases as high as 20 and 25 per cent, and now he was being offered an increase of less than four per cent. What had he done or what had he not done to warrant such treatment as this? His thoughts were suddenly interrupted by the "Old Man" remarking that he was to be congratulated on his raise.

Mechanically Jack thanked him and returned to the roundhouse, to the noise and hustle—to the smoke and gas which had become like home to him. There he could review the entire situation undisturbed.

As he thought over the question, Jack could not see but that he was entitled to at least as great an increase as some of his common workmen, for if he was not worthy, why had the company kept him on as general foreman? Wasn't his position of more importance than that of a workman? He certainly had to assume far greater responsibility. If he wasn't deserving in his present position, could he make good with the other concern if he should accept their offer? Who would take his job if he should leave? Could any of his foremen do any better than he had done?

These and many other questions ran through his mind until he gave up trying to decide until he slept over the proposition.

At the supper table that night his wife was commenting on the many increases in living expenses, quoting many staple articles of food which had doubled in price in a few months, and Jack remembered bitterly that his own value had increased less than four per cent after his years of service.

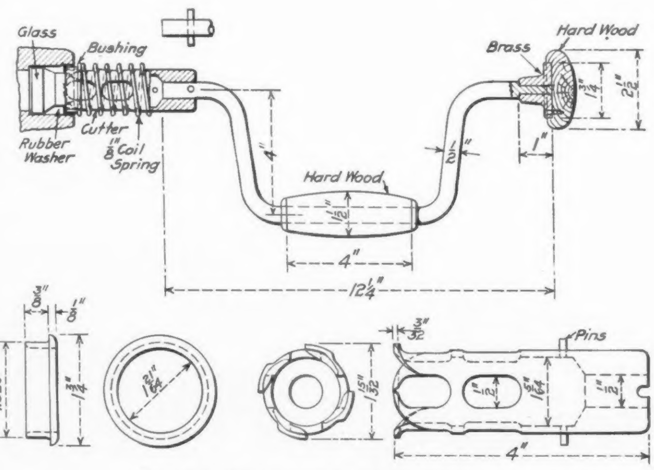
Then and there, Jack made the decision that gave him a just raise; he wrote the other concern that he would accept their offer and report for duty the first of the next month.

DEVICE FOR REMOVING GASKETS FROM SIGHT FEED LUBRICATORS

BY E. A. M.

When it becomes necessary to change a glass in sight feed lubricator, it is often difficult to remove the rubber gasket or washer, and the tool illustrated will be found convenient for this work. In fact, it is one of the many small tools that help in shortening a locomotive's time at terminal points, because they permit the work to be done much quicker than by the old hand methods.

As indicated, the cutting tool consists of a round piece of steel, counterbored and drilled with one end expanded and cut to form four teeth. These teeth are given proper clear-



Lubricator Gasket Remover

ance both ways and the cutter is hardened. A hardened steel bushing is provided which is just large enough to go into the lubricator, where the glass and rubber washer are held by a jamb nut.

The cutter is fastened to a homemade bit stock by a pin, as indicated, but before the tool is assembled, the bushing and a suitable coil spring are slipped on over the cutter, as shown. This is made necessary because on account of the clearance of the cutter teeth, their outside diameter is less than the inside diameter of the bushing.

In operation the jamb nut holding the broken lubricator glass is removed and the assembled tool is put in place with the bushing just fitting into the lubricator. The bit stock is then turned by hand and the gasket reamed out, the thread for the jamb nut being protected by the bushing. The object of the spring is to hold the bushing in place.

Reclaiming High Speed Steel

A Recently Devised Process Converts Scrap High Speed Steel into New Stock of the First Quality

WITHIN the past two years what practically amounts to a new industry has sprung up in Syracuse, N. Y., with the formation and development of the Onondaga Steel Company, Inc. This company's successful efforts in the reclamation of scrap high speed steel are noteworthy, and it is estimated that a total of nearly 500,000 lb. of this metal have been reclaimed since July, 1916, when the business was incorporated. It is hard to estimate the value of this saving, because high speed steel is one of the most important factors in all mechanical production, particularly with railroads, arsenals and navy yards.

Fig. 1—Original Quarters of the Onondaga Steel Co., Inc., at Syracuse, N. Y.

Railway shop men have long understood the necessity of saving the scrap turnings and chips of copper, brass, babbitt, etc., but, hitherto, no special attention has been given to the saving of high speed steel scrap, because its scrap value has been in no way proportional to the first cost. In some cases it has been used to tip certain tools by brazing or welding, and a few shanks have been drawn out to make tool bits, but in the main, broken and worn high speed steel reamers, drills, milling cutters, etc., have been allowed to go in with the scrap of carbon steel tools, when as a matter of fact they were worth more, pound for pound, than any of the non-ferrous metals except silver and gold. Probably from 20 to 40 per cent of the high speed steel manufactured in this country is thus lost to the trade.

The reason for the relatively low price of scrap high speed steel is its varying and uncertain quality and the difficulty in separating different kinds; each manufacturer has been unwilling to accept any except his own brand.

Realizing this condition, the founders of the Onondaga Steel Company set about to discover a way of separating high speed steel from carbon steel and they succeeded so well that it is now possible to distinguish not only different grades of high speed steel, but different brands of the same grade. When this method was developed the problem was to find what materials must be added to give the required chemical composition; also, it was necessary to develop special furnaces and, in fact, the entire method of steel treatment was worked out until finally a high speed steel was produced that satisfied the most exacting requirements and compared favorably with the best steel on the market.

Starting with a one-pot furnace in the small building illustrated in Fig. 1, the company has grown until its present capacity is 17 tons per month and the equipment includes five two-pot gas furnaces, two annealing furnaces and three small steam hammers.

A list of the company's customers shows that they are well scattered over the United States and Canada, and include 700 of the leading railroads, supply houses, motor companies and, in fact, every branch of the metal trades.

On account of the rapid growth of the business it has been necessary to provide more floor space and Fig. 2 shows a new set of buildings recently completed at Messina Springs, a suburb of Syracuse. The new plant is now almost ready for operation and the equipment will include five large furnaces, suitable annealing furnaces, a rolling mill, one 2,000-lb. and one 3,000-lb. steam hammer. It is estimated that the capacity of the new plant will be about 60 tons per month,

Fig. 2—The New Plant with an Estimated Capacity of 60 Tons Per Month

devoted exclusively to the reclaiming of high speed steel scrap.

Steel for reclamation is generally received in lots from twenty-five to a few hundred pounds. The steel is all brought up to one uniformly high standard and is not subject to the customer's specification, except in regard to size. It was originally planned to maintain a supply of standard stock sizes on hand, so that when a shipment of scrap high speed steel was received, an equal weight of finished bars might be immediately forwarded to the customer, but it has not been possible to follow this policy on account of the great demand for this service.

The Onondaga Company wishes it understood that their process applies only to the reclamation of scrap high speed steel, and it is not desirable to melt down bars of obsolete size, providing the quality is good, for they can be drawn out to needed sizes, welded or made suitable for use in some other way.

Briefly stated, the reclamation process is as follows: A decidedly miscellaneous assortment of scrap high speed steel arrives at the plant for reclamation. It consists of broken drills, worn out reamers, broken taps, obsolete milling cutters, the shanks of lathe tools, end trimmings from the forge shop, etc. As suggested earlier in the article, the success of the entire proposition hinges on the possibility of correctly sorting this scrap, and experts have been developed who test each piece separately on an emery wheel and are able to tell by comparing the sparks with those of known samples, not only what kind of high speed steel it is, but the grade as well. Chips and turnings cannot be used unless they are absolutely free from foreign material.

After sorting, the different grades are so proportioned that a constant mixture results and the required new elements are added to give a uniform composition. The steel when melted is poured in the form of ingots about 4 in. square by 2 ft. long, which are carefully treated. They are then sent to the surface grinder. It is necessary to grind out all surface checks, slag holes, etc., otherwise these imperfections when hammered into the finished bars develop into seams. After being ground, samples are taken for chemical analysis.

The ingots are drawn out or cogged under a heavy steam hammer to bars 2 in. square by about 6 ft. long and again they go to the grinder for removing sharp edges and surface imperfections, and then forged as often as necessary to bring them down to the required size for finishing. After each cogging or roughing operation the bars are very carefully inspected for fracture. When surface imperfections are found the same are carefully ground out.

Proper inspection forms a vital part of the process and the greatest care is exercised from sorting the scrap to shipping the finished product, in order that only the best grade of

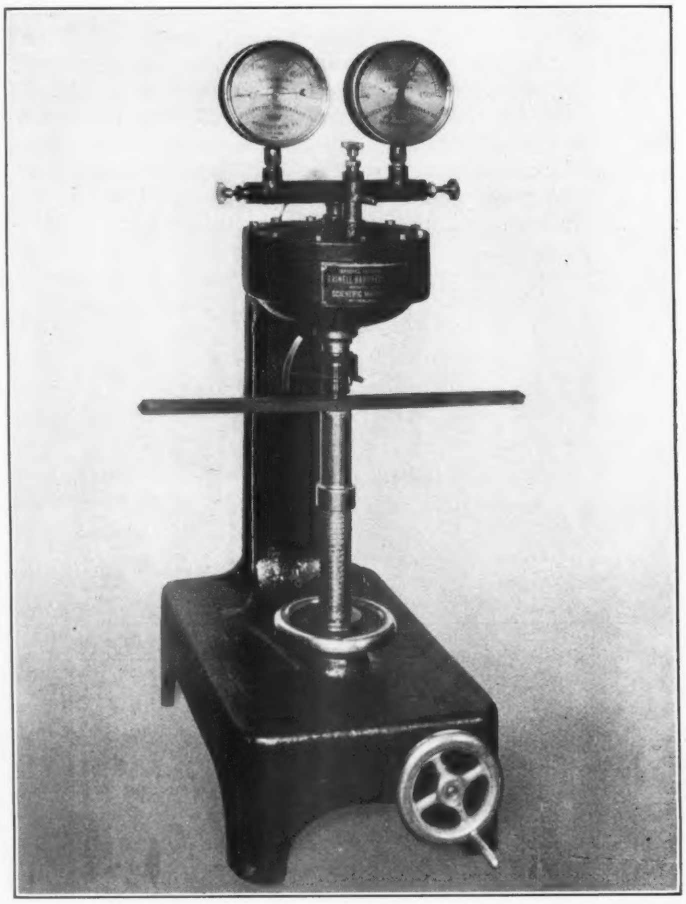


Fig. 3—Brinell Instrument Used in Testing the Hardness of Reclaimed Bars

high speed steel shall be produced. In addition to the chemical test and constant inspection during the process of manufacture, each heat is tested for hardness by Brinell's method. Here again the results show but little variation,

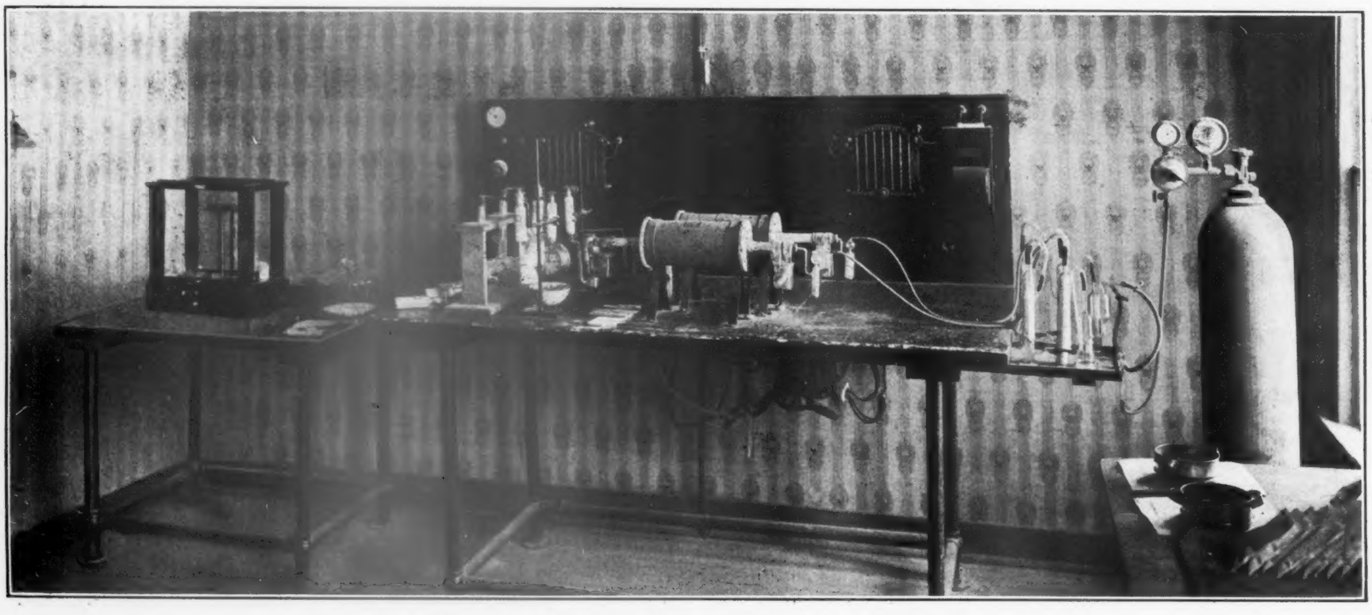


Fig. 4—Laboratory In Which Tests Are Made of Onondaga Steel

which indicates that the product is uniform. Figs. 3 and 4 show the Brinell instrument and the testing laboratory.

In conclusion it may be stated that the Onondaga Steel Company has taken a step in the right direction, and by thus converting high speed steel scrap into a useful material it has done much to conserve this class of steel.

MISCELLANEOUS EQUIPMENT AT THE SHOREHAM SHOPS

BY F. W. SEELERT

A handy drill jig for holding locomotive handrail columns has been developed at the Shoreham Shops of the Soo Line and is shown in Fig. 1. It is adjustable for any height of column and is arranged to drill and tap the hole in the base as well as to drill the large hole in the head for the railing pipe. As indicated in the illustration, the movable bracket is adjusted to suit the handrail column and a spanner wrench is used to tighten the hollow, threaded holding nut.

Fig. 2 shows a fixture for holding eccentric straps while drilling the holes for the babbitt inserts as used by many railroads. This fixture is constructed of boiler plate and angle iron and is made to hold any size of strap on the system. The boiler plate proper to which the strap is clamped is arranged to swing about a center which coincides with the center of the strap and the whole may be clamped in any position by means of a nut on the back side.

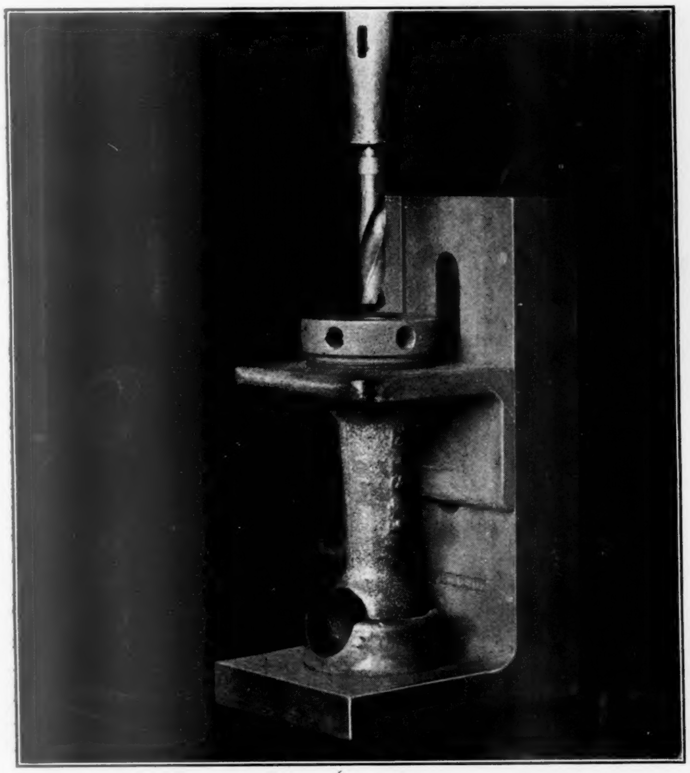


Fig. 1—Drill Jig for Holding Handrail Columns

A pneumatic riveting and shearing machine for coupler yokes is shown in Fig. 3 and attention is called to the heavy construction which is necessary for this kind of work. The machine is composed of the 28-in. by 18-in. stroke cylinder *A* with lugs *B* cast on both sides. To the lugs are fastened the 16-in. I-beams, which in turn are reinforced and supported by the plates *C*, 1 in. by 15 in. by 8 ft. long. These are bent around the cylinder. Underneath the cylinder *A* a 10-in. diameter cylinder that is filled with kerosine is mounted. This cylinder is provided with a by-pass valve and acts as a cushion for the air cylinder, as without this cushioning effect the machine would soon jar itself to pieces. The holes in the levers at *D* and *D* are slightly oblong to allow for the radial movement of the levers. The ratio *D E* to *E D* is three to one, making a pressure of about 73 tons on the ram *R* at an air pressure of 80 lb. in the cylinder *A*. The machine is operated by the three-way cock *H*. The cutout cock *I* operates the brake cylinder *K* by means of which the couplers are pushed against a stop and held in place while the rivets are being sheared. The air cylinder *A* is single acting, but in cold weather the piston is a little sticky. To counteract this the air pipe leading into the top head with the three-way cock *J* was applied, to force it

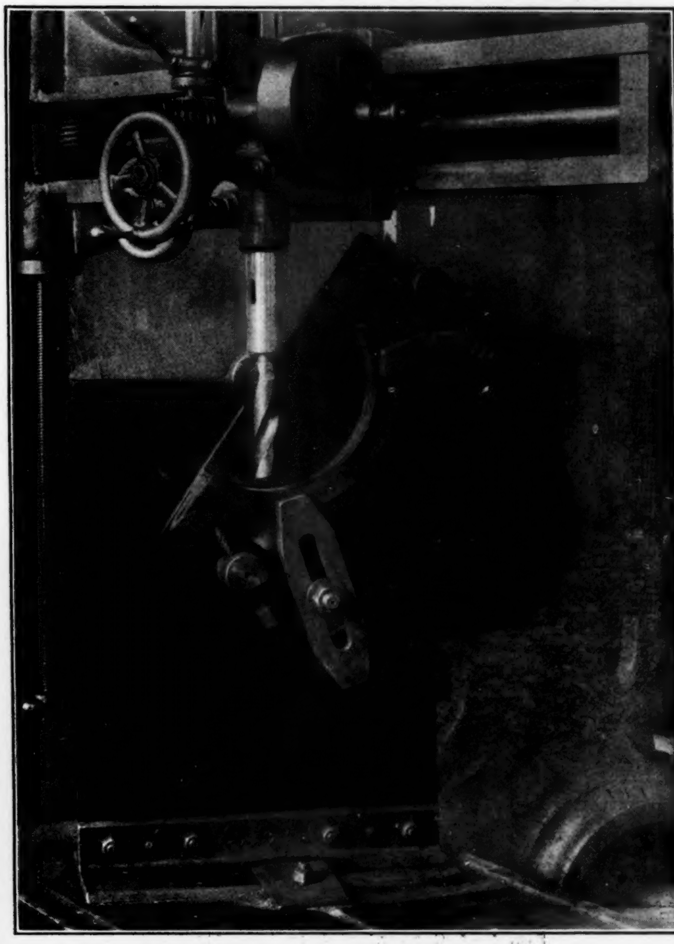


Fig. 2—Fixture for Holding Eccentric Straps

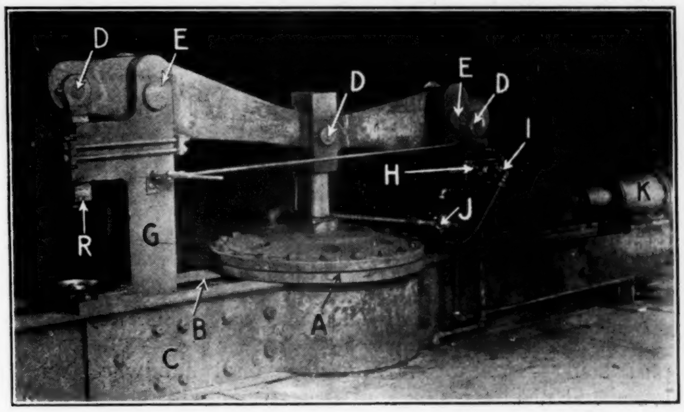


Fig. 3—Pneumatic Riveting and Shearing Machine for Coupler Yokes

down. The levers and the upright G are forged from a good grade of hammered iron.

All shearing is done on the right hand side of the machine and riveting on the left by means of the hardened ram R and the opposite plate which are both cupped to give the required shape to the rivet heads.

The home-made stenciling machine shown in Fig. 4 is used for marking or stenciling the sizes and numbers on reamer shanks, tap shanks and similar tools. The spindle to which the long operating lever is attached is hollow and the rod inside of it is threaded on one end to receive the ball crank, as shown. The other end of this rod has an interesting arrangement for quick release of the stencil collars.

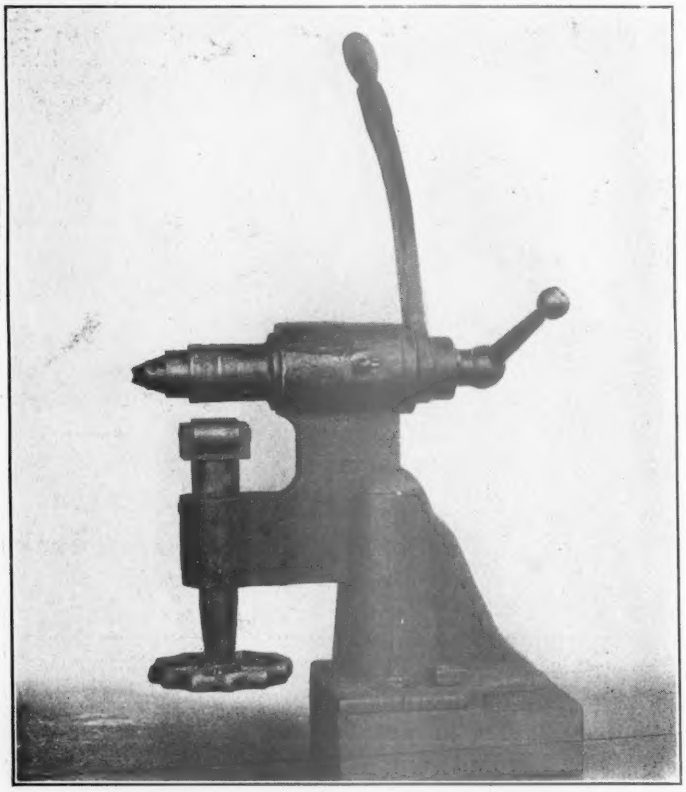


Fig. 4—A Convenient Stenciling Machine

There are several different collars clamped on the front end of the spindle. As on a tap for instance, the size, number of threads, shape of thread, V or U. S. S., and the owner's monogram are all stenciled on at one operation. The tap or reamer to be marked is laid on the two rollers on the adjustable support right under the spindle, the support being raised by turning the small handwheel on its lower end until the shank of the tap or reamer bears tightly against the two plain contact washers or rollers. These contact washers control the depth to which the figures are stenciled. The spindle is then given a part of a revolution, just enough to roll the figures over the shank of the work. The collars that are used in this machine are also a home product and are arranged so that any combination of fractions and thread numbers can be obtained. For sizes over 1 in. we have collars that stamp the whole number at once—like 1¼ in. or 1½ in. and some other much used sizes. The little knob shown in front of the main bearing can be slipped into a circular slot in the spindle so as to limit the stroke of the operating lever.

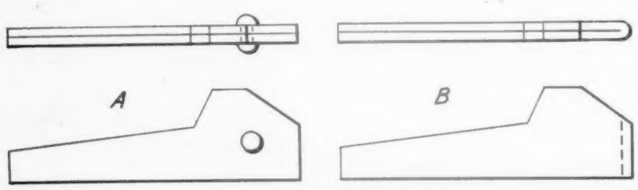


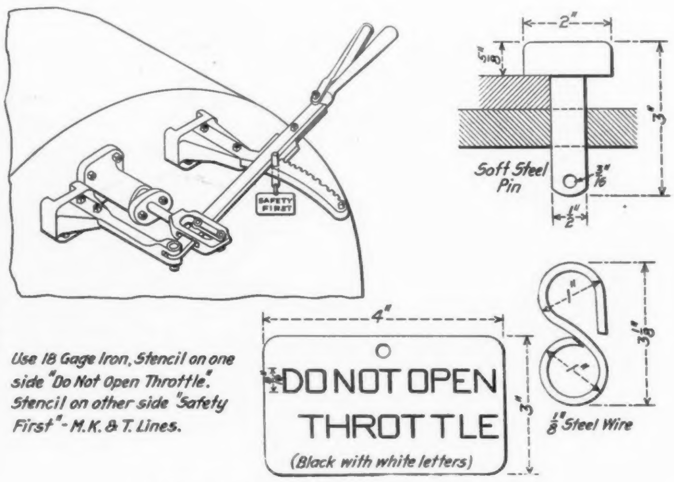
Fig. 5—A Riveted and a Home Made Cotter Key

Fig. 5 shows the method of making small cotter keys for use on ashpan and similar work. At Shoreham most of these keys are made from old standard flues which are rattled, heated and flattened out and then the keys are punched out as shown at B, Fig. 5. As this key requires no riveting it can be produced at a considerably lower cost than the key shown at A, Fig. 5.

THROTTLE SAFETY APPLIANCE

The Missouri, Kansas & Texas has recently issued instructions to equip all locomotive throttle quadrants with a pin and Safety-First tag as shown in the illustration. The pin is placed in a hole drilled in the quadrant just behind the throttle lever when it is closed, and a suitably metal tag is attached to a hole in the bottom of the pin by means of a wire hook. On one side of the tag are stamped the words "Safety First—M., K & T. Lines," and on the other side the phrase, "Do Not Open Throttle."

In practice no man is allowed to do any work beneath an engine which is under steam until he has first put one of these pins in the quadrant and attached the tag. In this way he is amply safeguarded, for the engineer or hostler will not remove the tag and pin and start the engine without first looking to see if someone is underneath. Some roads are already equipped with such pins to prevent opening of the throttle, either accidentally or by some unauthorized person. These are applied whenever a locomotive is at rest in the engine house territory irrespective of whether work is being done on the engine or not.



Safety Pin for Locking Throttle Levers

ELECTRIC LOCOMOTIVES FOR MANCHURIAN COAL MINE.—The 50-ton electric locomotives for use by the Fushun collieries for freight handling are the first of the kind ever built at the South Manchuria Railway workshops. They are for the standard gage. Each locomotive is designed to haul 580-ton trains at the speed of 12.9 miles per hour on the level tangent track, exclusive of the weight of the locomotive, the trolley voltage being 1,200 volts. They are of the two-bogie type, each bogie carrying 125-horsepower motors. The total weight is 97,200 lb.; ballast weight, 15,200 lb.; weight on drivers, 112,400 lb.; weight per driving axle, 28,100 lb.; and weight of a motor, 5,000 lb.—*Commerce Reports.*

NEW DEVICES

A NEW AXLE LATHE

The No. 3 axle lathe illustrated in Fig. 1 is a high production machine recently placed on the market by the Niles-Bement-Pond Company, 111 Broadway, New York. It is designed for machining axle forgings, as well as rough turned axles, and being center driven is adapted for turning wheel seats and journals at both ends of car axles simultaneously.

The bed is of rigid construction reinforced by cross-girts of box section 8 in. wide. The tracks for the carriage consist of a wide flat way at the back of the bed and a track of an improved compensating "V" shape at the front. This "V" track has an angle of 15 deg. at the back and an angle of 70 deg. at the front. The 15 deg. angle on the back of the "V" serves a double purpose, in that it presents a thrust surface at right angles to the combined forces of the tools, thus eliminating all tendency of the carriages to climb under heavy cuts, and it automatically compensates for wear of both the carriages and the bed.

The center driving head is of massive construction, completely enclosing the main driving gear and forming an oil reservoir in which the gear runs. It is clamped to the bed by six large bolts and is adjustable longitudinally along the bed. The main drive is by means of the large steel herringbone type gear and pinion, shown in Fig. 2. The gear and pinion are carried between bearings in the head, which are of large proportions and special provision is made for a liberal supply of oil. Because of the spiral action of the teeth, the herringbone gear provides a smooth, powerful drive, and all objectionable noise is eliminated when running at high velocity. The axle is driven by a steel equalizing driving plate, having lugs cast integral which engage both ends of the double driver dog. By means of this driving plate crooked or irregular axles can be machined without setting up bending strains. The lathe is provided with two carriages, which have power longitudinal feeds by a right and left hand screw positively driven by gearing. The split nuts engaging the leadscrew are provided with automatic opening devices which release them when the carriages come in contact with set collars on the tappet rod at the front of the machine.

The carriages are held down by clamps for their full length and are adjustable to the front and back vertical surfaces of the bed by taper gibs. Two clamps are provided at the front of the carriages. One of these is used for clamping the carriage to the bed when turning against shoulders and facing the ends of the axles. This clamp is operated by a bolt on the top of the carriage. The other clamp is under the bridge and further decreases the tendency of the carriage to lift during the burnishing operation.

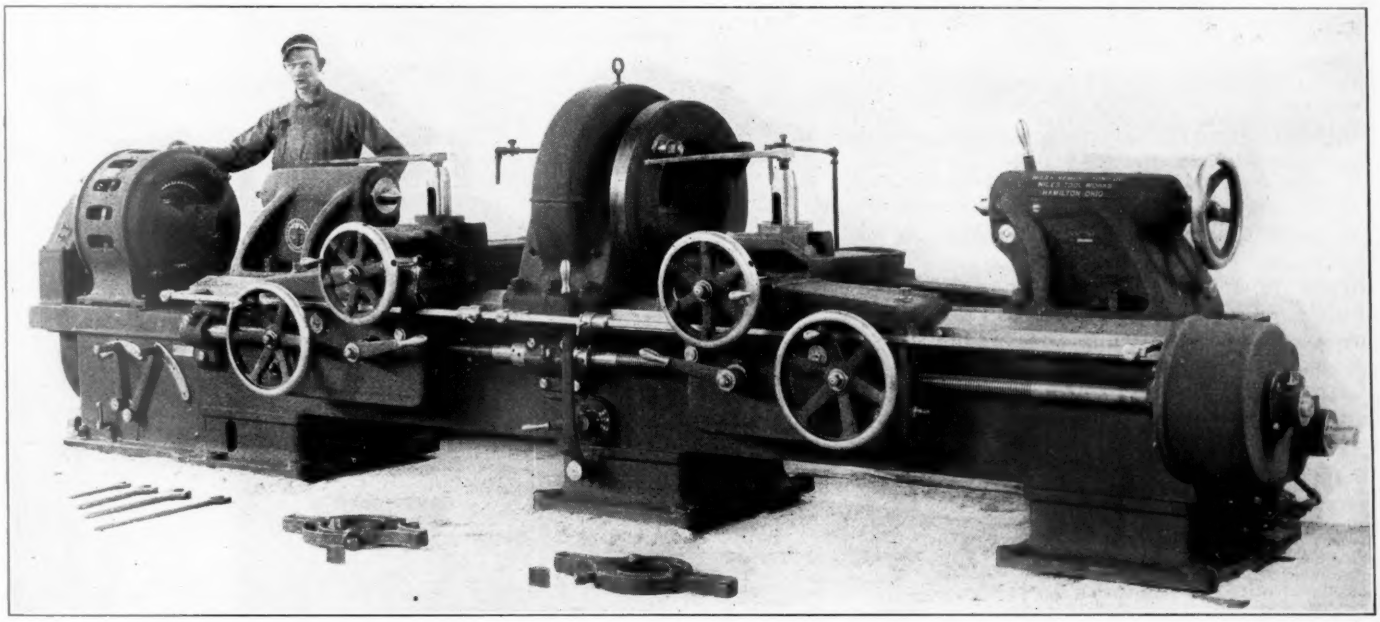


Fig. 1—A New Axle Lathe Designed for High Production

Wipers are attached to both carriages, to remove all chips and dirt from the shears. They are fitted with felt pads and provide the surfaces with a continuous supply of clean lubricant. A complete lubricating system for the tools is provided by means of a pump, jet pipes, reservoir and collecting channels. The tool slides are provided with a trough which is connected with channels in the carriage bridge for carrying off the lubricant. The aprons are of double wall con-

struction, and all of the mechanism except the operating levers, is completely enclosed. All shafts are supported at both ends.

The feed gears are located at the right hand end of the bed and are completely enclosed. The feed change lever is placed at the center of the machine within easy reach of the operator. Three feeds are provided for the carriages 1/16 in., 3/32 in. and 3/16 in. The carriages have hand traverse on the bed and tool slides have hand cross feed.

The axle is carried on dead centers mounted in two heavy tail-stocks which are adjustable longitudinally along the bed and can be clamped in position by four large anchor bolts. To prevent slipping, a pawl is provided which engages a rack cast in the bed. The tailstocks have taper gibs at the front and back of the bed, permitting the alinement of spindles.

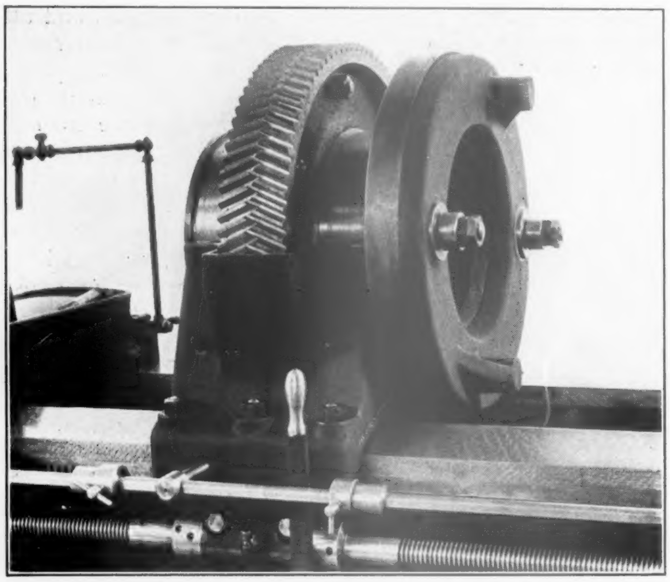


Fig. 2—The Herringbone Type Gear and Pinion Drive

The spindle of the right hand tailstock is adjustable by a handwheel.

Four different methods of driving this lathe are provided so the purchaser may select the one best suited to his requirements. They include the cone pulley, the single pulley mounted on a speed box, the alternating current motor and the direct current motor drives.

For handling axles in and out of the lathe a crane can be furnished at extra cost. This crane has a convenient gripping device and a chain hoist and axles can be easily handled by one man. The following are given as the general dimensions of the machine:

Swing over bed shears	30½ in.
Swing over tool slide	13 in.
Diameter of hole in driving head	13 in.
Maximum distance between centers	9 ft. 3 in.
Length of bed	14 ft. 0 in.
Diameter of tailstock spindles	5 in.
Traverse of R. H. spindle	9 in.
Length of carriage bearing on bed	30 in.
Number of feeds	3
Feeds per revolution of driving head	⅙ in., 3/32 in., 3/16 in.
Revolutions per minute	16 to 48
Kinds of drive	4
Cone pulley:	
Number of steps	3
Maximum diameter of pulley	32 in.
Width of belt	7 in.
Speeds to driving head	6
Floor space	17 ft. 2 in. by 4 ft. 8 in.
Single Pulley:	
Diameter	26 in.
Width of belt	8 in.
Speeds to driving head	4
Floor space	17 ft. 2 in. by 4 ft. 8 in.
A. C. Constant Speed Motor:	
Driving motor, hp	25
Speeds to driving head	4
Floor space	18 ft. 9 in. by 4 ft. 3 in.
D. C. Adjustable Speed Motor:	
Driving motor, hp	25
Speeds to driving head	16 to 48
Floor space	19 ft. 1 in. by 4 ft. 0 in.

FEEDWATER TREATMENT

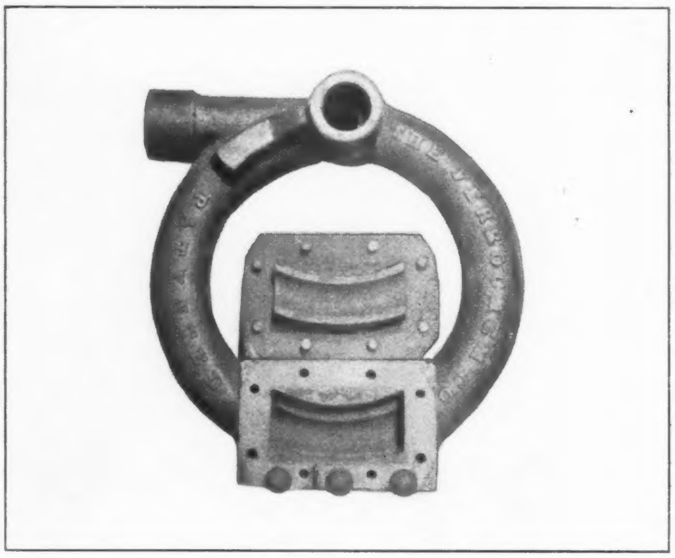
The present coal shortage and demand for increased boiler efficiency call attention once more to the ever present need of a satisfactory feed-water treatment. It is self-evident that scale not only lowers the equivalent evaporation of a boiler and the available boiler horsepower, but decreases the life of tubes and firebox sheets.

Among the non-chemical methods of treating feed-water, that devised by the Ferrochem Company, Ltd., 30 Church street, New York, is interesting and has given good results in actual practice. Perhaps the most notable example has been in the treatment of Los Angeles city water, where an analysis showed the following content:

	Grains per gallon
Total solids	28.0
Organic and volatile	3.2
Sodium chloride	2.8
Sodium sulphate	3.9
Calcium carbonate	5.9
Magnesium carbonate	4.6
	Trace
Silica—Free carbonic acids	9.3

This water is very bad, forming hard scale in a short time and it has been successfully treated by the Ferrochem process for a number of years.

As shown in the illustration the machine is simple in construction, consisting of three balls rotating in a circular raceway through which the water passes before going to the boiler. The balls are made of an alloy of pure metals, which is readily abraded when the balls are whirled in the raceway by the action of the water. Fine particles of Ferrochem metal then enter the boiler with the water and neutralize the scale forming salts, both those in solution as well as those in suspension. This prevents the salts from cementing



Apparatus for Ferrochem Water Treatment

themselves together in the form of hard scale on the exposed surfaces of the boiler. It is claimed that the introduction of Ferrochem metal into a boiler not only neutralizes all the salts in incoming water, but softens and loosens the scale already formed. The precipitation of the salts is in the form of a sludge or mud which does not harden and may be readily blown or washed out.

Among the advantages of a non-chemical method of feed-water treatment may be mentioned less danger of foaming, no decomposition of packing and gaskets, and exhaust steam that is not contaminated by various chemicals.

Also the non-chemical method just described has an additional advantage in being automatic in action and requiring practically no care.

The success attending the use of the Ferrochem method in

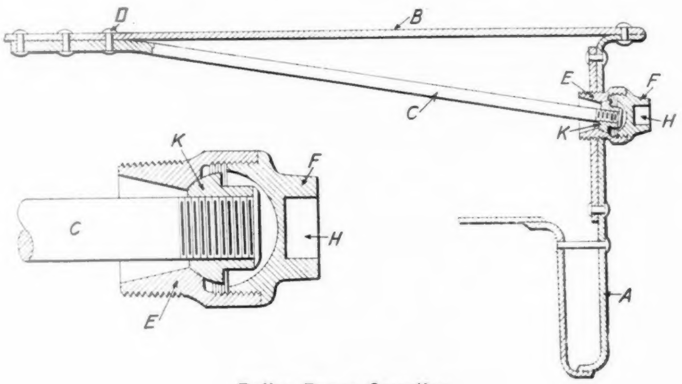
industrial plants raises the question as to its application to locomotive feed-water problems and there is no apparent reason why it should not work out well. There would be about two pounds back pressure due to the machine, so it probably could not be used between the tank and the locomotive injector, but it could be placed between the water supply and the tower or trough from which the water is taken, as the case may be.

BOILER BRACE COUPLING

An improvement in the method of fastening boiler braces has been recently patented by S. U. Walck, of Lansford, Pa., and the device is shown in detail in the illustration, which is a vertical section through the boiler where the brace is applied.

Referring to the illustration, *A* is the back head of the boiler and *B* the wrapper sheet. The brace *C* is held by rivets to the wrapper sheet and the back head is drilled and tapped with a standard boiler tap to take the shell *E*. As indicated, this shell is chamfered and has a concave seat machined to suit the convex face of the nut *K*. *K* has a square head and may be tightened by means of a suitable wrench. The shell *E* is threaded on the outer end to receive the cap *F* which is provided with a recess *H* to allow for tightening.

In applying the brace and coupling, the inner end of the brace is securely held to the wrapper sheet by riveting or otherwise and the threaded portion is passed through the shell. The nut is tightened on the brace, so that a few of the threads will project through and may be riveted over.



Boiler Brace Coupling

The cap is then screwed into the shell, enclosing the nut in the manner shown and making a steam-tight joint.

If it becomes necessary to inspect the braces, the cap may be removed by a wrench inserted in the recess in the end and should the brace and nut turn together, it will be evident that the brace is broken. In order to remove the part of the brace which is riveted to the boiler sheet the rivets holding firm may be cut, allowing the inner portion to fall down and be taken out. After the old brace is removed, a new one may be slipped into the boiler through the opening in the end of the boiler head and the inner end drawn up to the wrapper sheet. After tapping out the old holes, screw plugs may be screwed into the wrapper sheet and brace, allowing them to extend above the sheet for a distance of a few threads, which may be afterwards riveted over, the same as a staybolt, thus making a tight joint. The shell may then be screwed into the boiler head and the parts replaced, as already described.

This form of boiler brace possesses the advantages of being easily applied and readily inspected. In addition, it provides a flexible connection at one end and is much less likely to break than a rigidly riveted brace.

AIR VALVE LIFT GAGE FOR CROSS COMPOUND AND SINGLE STAGE STEAM DRIVEN AIR COMPRESSORS

The purpose of the air valve lift gage, which is made by the Westinghouse Air Brake Company, is to enable repairmen to determine the lift of air valves of steam-driven air compressors.

To determine the lift of the left hand air valve, the gage is first applied to the left flange of the air cylinder, as illustrated in Fig. 1, and the sliding arm adjusted until its end rests against the stop on the air valve, in which position it is locked by means of the thumb nut. With the arm thus locked,

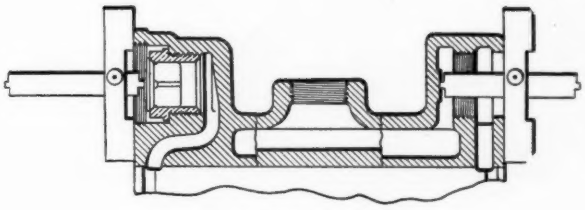


Fig. 1

the gage is applied to the valve cap, as shown in Fig. 2. If the gage arm fails to touch the stop on the valve when the shoulder on the sliding bar rests upon the face of the collar, the valve has a lift greater than standard by an amount equal to the distance between the gage arm and the stop. If this lift is greater than the maximum permissible, a repair valve having a long stop is substituted for the old valve and the

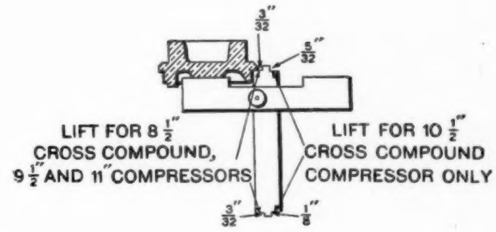


Fig. 2

stop lowered until the standard lift is reached, as indicated by the gage.

To determine the lift of the right hand air valve, the gage is first applied to the right flange of the air cylinder, as illustrated in Fig. 1, and the sliding arm adjusted until its end rests against the stop in the cylinder, in which position it is locked by means of the thumb nut. With the arm thus locked the gage is applied to the air valve cage and air valve, as

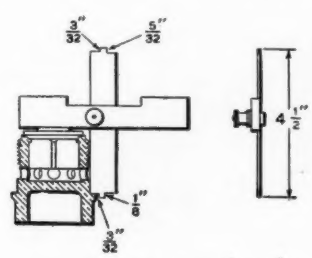


Fig. 3

illustrated in Fig. 3, and if the valve has proper lift, the shoulder on the sliding arm will just rest upon the upper side of the collar of the air valve cage, as illustrated. If the gage arm fails to touch the stop on the valve when the shoulder on the sliding bar rests on the collar face on the cage, the valve has a lift greater than standard by an amount equal to the distance between the stop and the gage arm.

PORTABLE ELECTRIC DRILL AND GRINDER

Portable electric tools which replace hand operation, save time and labor and increase the output of a given number of men. Particularly is this true of a portable electric drill such as that shown in Fig. 1. Less "elbow room" is required by a workman using this device. and since he can drill a great many more holes per hour, he can replace a number of men who may be given to other tasks. This drill, which is manufactured by Gilfillan Brothers Smelting and Refining Company of Los Angeles, Cal., is equipped with gears to give two speeds. The speeds are changed by means of a knob on the bottom of the gear case. The gears themselves are made of chrome nickel steel and run in grease. Ball bearings are used throughout. A ½ in. Standard chuck and a sturdy electric switch are provided. The speed range is 400 r.p.m. on low speed and 700 r.p.m. on high speed, Westinghouse motors being furnished.

Fig. 1—Portable Electric Drill

The same company also manufactures a tool post grinder shown in Fig. 2 and adapted for use on lathes. An angle plate can be clamped around the tool post and a vertical adjustment of the grinder is provided. This grinder is equipped with a Westinghouse ¼ hp. motor running at 3400 r.p.m. It is also provided with a six in. by three-eighths in. grinding wheel, an extension mandrel for internal grinding fitted with a 1½ in. by ⅜ in. wheel, a tooth rest for cutter grinding and an electric attachment plug with 7½ ft. of cord.

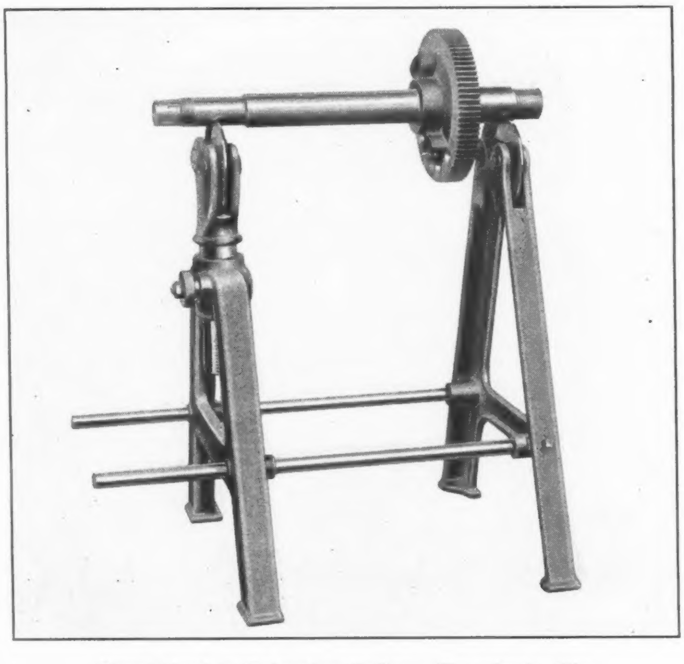
Fig. 2—Tool Post Grinder

BALANCING STAND

The balancing stand illustrated is manufactured by the Rockford Tool Company, Rockford, Ill., for the purpose of balancing pulleys, cones, armatures, flywheels, etc.

The end brackets or standards are adjustable in or out to suit the length of the part to be tested, and in the larger sizes this adjustment is made by means of a rack and pinion. On each standard there are two rotating disks which have been hardened and ground and are supported on ball bearings. The special arrangement of ball bearings used makes these disks turn with great ease and for that reason the stand is exceedingly sensitive. The two disks on each standard are separated so that a round bar of iron may be supported by them at four points and be free to turn easily.

In operation, the stand is placed on a reasonably level floor and no further leveling or adjustment is necessary. The shaft and pulley or flywheel, as the case may be, is then allowed to rest on the disks, and any lack of balance will be evident and may be corrected in the usual way.



Stand Used in Balancing Pulleys, Fly-wheels, Etc.

The advantages of this tool are its great sensitiveness and the fact that it does not have to be leveled like the old-fashioned parallels. The stand is made in the following five sizes:

	Swing	Greatest distance between standards	Capacity
No. 1 bench size	22 in.	20 in.	800 lb.
No. 2 floor size	46 in.	30 in.	800 lb.
No. 2-A floor size†	46 in.	30 in.	2,000 lb.
No. 3 heavy size*	6 ft.	6 ft.	5,000 lb.
No. 4 heavy size*	8 ft.	8 ft.	10,000 lb.

†No. 2-A has extra heavy bearings and large disks.
*Nos. 3 and 4 are fitted with a rack and pinion for adjusting distance between standards.

Shorten the War.—The sooner the irresistible might of this great republic is organized and put into full action the sooner the war will end. Every dollar invested in government securities works to shorten the war, to save the lives of American soldiers and sailors. Buy Liberty Bonds.

Railway Mechanical Engineer

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WE GUARANTEE, that of this issue 7,700 copies were printed; that of these 7,700 copies 6,557 were mailed to regular paid subscribers, 137 were provided for counter and news companies' sales, 341 were mailed to advertisers, 166 were mailed to exchanges and correspondents, and 499 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 32,600, an average of 8,150 copies a month.

The RAILWAY MECHANICAL ENGINEER is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

Word received from Captain William R. Pearson, of Company C, 35th Engineers (Railways), indicates that that regiment is now in service in France. The 35th Engineers was stationed at Camp Grant, Rockford, Ill., previous to its departure for Europe.

In a fire in the Southern Pacific terminal at Lordsburg, N. M., on the 14th of March, a roundhouse, six locomotives, a number of freight cars and a large amount of stores, including fuel oil, were destroyed, the total loss being estimated at several hundred thousand dollars.

Director-General McAdoo has addressed to the railroads a questionnaire asking information concerning the use of varnish on cars and locomotives during the calendar year 1917. Reports must show the brand, vendor, manufacturer, amount used for various purposes, total cost and price per gallon.

Obsolete or obsolescent locomotives may be useful somewhere, and Director-General McAdoo has addressed a circular letter to the presidents of Class I railroads asking for information regarding all locomotives which are not in service by reason of age, condition, size, weight, etc., but which, if in good condition or properly repaired, could be used to advantage on roads of less traffic density or more favorable operating conditions.

In order to give some recognition to men who have helped to build up its record of efficiency, the Canadian Pacific has decided to name certain of the Canadian Pacific locomotives after the engineers who, by meritorious conduct or by acts of special bravery have, in the opinion of the management, earned the right to special distinction. It is not the intention to name every locomotive at once, but only those in passenger service, and to keep each name as a privilege and a reward.

In an explosion and fire at the Jarvis warehouse, Jersey City, N. J., on March 26, the repair shops of the Erie Railroad, on the north side of the main line near the Jersey City passenger station, were destroyed; estimated loss, $300,000; loaded freight cars to the value of $200,000 (estimated) were also destroyed. The explosion caused, altogether, damage to the amount of about $1,500,000, and fire brands were blown across the river to New York, damaging the Erie station and ferry-house. It is understood that the company will not rebuild on the same site.

A shortage of passenger cars is reported by the Pennsylvania Railroad. This unusual condition has arisen in connection with the rapid growth of war industries in the section between Philadelphia and Baltimore. Special trains are run daily to and from such industries in six localities which require the use of 215 cars. In addition, 15 cars daily will be required soon for further special industrial service in this locality. In order thus to provide for these essential war industries, it has been necessary to limit the length of some suburban trains in the neighborhood of Philadelphia and Baltimore.

The mining of clean coal is to be enforced by the Fuel Administration, according to an announcement which has recently been made. An inspection system will be organized Under the new plan adopted, coal condemned by the Fuel Administration, either lacking preparation or because it contains a high percentage of impurities, will be sold at 50 cents a ton less than the fixed Government price for the mine. The inspection system will be operated through the district representatives of the Fuel Administration, who are authorized to appoint a sufficient number of inspectors to carry out the terms of the order, which went into effect on Monday, March 11.

The Pennsylvania Railroad has issued a pamphlet containing brief articles by a dozen or more employees of the road, telling from their own experiences, how railroad men may make themselves efficient in the duty of helping to win the war. These writers are Edward F. McKenzie, locomotive engineman; Wm. Parker, car repairman; T. T. Buck, engineman; S. C. Lowrey, engineman; U. S. Shearer, engineman; John Phelan, track foreman; H. S. Meyer, engineman; H. P. Peterson, engineman; H. E. Emery, station agent; Emanuel Shepp, track foreman; Hugh Mulloy, track foreman; H. F. Krear, engineman; Thomas M. Finn, engineman, and P. L. Smith, fireman.

The director-general has announced the creation of a Car Repair Section, and an Inspection and Test Section of the Division of Transportation. The former will be in charge of J. J. Tatum, superintendent of the freight car repair department of the Baltimore & Ohio, as manager, with office in the Southern Railway building, Washington, D. C. The manager of the section will supervise the condition of and repairs to freight and passenger cars in all existing railway

shops, and at outside shops. C. B. Young, mechanical engineer of the Chicago, Burlington & Quincy, has been appointed manager of the Inspection and Test Section, with office in the Southern Railway building, Washington, D. C. He will have charge of the test and inspection of materials and work in connection with the construction of standard locomotives and cars.

The President has approved the recommendation of the price-fixing committee of the War Industries Board that the maximum prices heretofore fixed by the President upon the recommendation of the board upon ore, coke, steel and steel products, subject to revision on April 1, 1918, be continued in effect until July 1, 1918; from April 1 to July 1, however, the maximum price of basic pig iron be reduced from $33 to $32 per gross ton, and that the maximum price of scrap steel be reduced from $30 to $29 per gross ton. No new contracts calling for delivery of any of said commodities or articles on or after July 1, 1918, are to specify a price unless coupled with a clause making the price subject to a revision by any authorized United States Government agency.

Frank McManamy, manager of the Locomotive Section of the United States Railroad Administration, has appointed the following railroad officers as a consulting board to consider matters relative to the maintenance of locomotives, the distribution of locomotives to various shops for repairs, shop production and practices, and other matters of a similar character: H. T. Bentley, superintendent of motive power, Chicago & North Western; C. E. Chambers, superintendent of motive power, Central of New Jersey; C. E. Fuller, superintendent of motive power, Union Pacific; J. Hainen, assistant to the vice-president, Southern; D. R. MacBain, superintendent of motive power, New York Central Lines West; John Purcell, assistant to the vice-president, Atchison, Topeka & Santa Fe.

Announcement has been made of the personnel of Railway Board of Adjustment No. 1 created by the Railroad Administration to deal with controversies between the railroads and the organizations of train service employees growing out of the interpretation or application of the provisions of wage schedules or agreements. The board will consist of four representatives of the railroads and four officers of the brotherhoods, as follows: E. T. Whiter, assistant general manager of the Pennsylvania, Western Lines; J. G. Walber, secretary of the Bureau of Information of the Eastern Railroads; J. W. Higgins, executive secretary of the Association of Western Railways; C. P. Neill, manager of the Bureau of Information of the Southeastern Railroads; L. E. Sheppard, vice-president, Order of Railway Conductors; F. A. Burgess, assistant grand chief, Brotherhood of Locomotive Engineers; Albert Phillips, vice-president, Brotherhood of Locomotive Firemen and Enginemen, and W. N. Doak, vice-president, Brotherhood of Railroad Trainmen. The board will hold a meeting at Washington on Monday to organize and will proceed immediately to consider a number of pending disputes.

Thirty-Seventh Regiment Electrical Engineers, Being Recruited

A regiment of electrical engineers is being recruited in Chicago as rapidly as possible for service in France. The selection of non-commissioned officers has not been made and the men who enlist will have chances for these places. Men who are skilled in the following trades will be enlisted: Cooks, machinists, blacksmiths, metal workers, foundrymen, patternmakers, plumbers, electricians, pipe fitters, draftsmen, storemen, carpenters, welders, boilermakers, bricklayers, masons, chauffeurs, handymen and linemen. The regiment will also need operators of oil, steam and gasoline engines and electrically driven pumps. The regiment will be known as the 37th Engineers, and will be commanded by Colonel Theodore A. Dillon, an officer of the Engineering Corps of the Regular Army, who has been relieved from duty as electrical engineer of the Panama Canal to command this regiment. A special recruiting office has been opened at 120 West Adams street, Chicago, in charge of Major Arthur B. Kratz, Engineer Officers' Reserve Corps, also formerly on the Panama Canal.

Railway Regiments' Thanks for Tobacco

A number of letters have been received expressing the appreciation of the men in the railway regiments now in France for the tobacco which they have received as a result of the contributions to the Railway Regiments' Tobacco Fund, by railway supply companies in the United States. C. W. Kutz, colonel commanding the Thirteenth Engineers, writing on March 1, says:

"Ever since December 21, when I acknowledged receipt of your letter, we have been on the lookout for the shipment of tobacco which you had made. Yesterday our patience was rewarded by the receipt of three cases of smoking tobacco. . . . The members of this regiment feel very fortunate in having such friends as the contributors to the 'Railway Regiments' Tobacco Fund,' and hope by their actions to fully justify the interest of their friends in the United States. . . ."

Major John A. Laird, commanding the 12th Engineers, writing on February 27, expresses similar hearty thanks for three cases received on February 26.

V. J. Jaeger, Co. F, 13th Engineers, writing on March 4, acknowledges receipt of the first consignment of "generosity" from the Railway Supply Companies' Fund. "Words fail to express our appreciation. The smokes are the answer to our difficulties and a solace to the ills engendered in dovetailing railroading with the military end of this war game. In the language of our French comrades we simply say 'Je vous remercie.' "

Col. W. P. Wooten, of the 14th Engineers, acknowledging receipt of three cases of tobacco, sends thanks to the donors and says that the men's enjoyment of the gift has been great.

During the past month one new subscription to the Railway Regiments' Tobacco Fund for $10 a month for 12 months was received from the Rome Iron Mills, Inc., New York; a donation of $20 was made by the McConway &

RAILROAD CLUB MEETINGS

Club	Next Meeting	Title of Paper	Author	Secretary	Address
Canadian	Apr. 9, 1918	Freight Brake Maintenance	F. B. Farmer	James Powell	P. O. Box 7, St. Lambert, Que.
Central	May 10, 1918	Radiant Heat and Locomotive Design	J. T. Anthony	Harry D. Vought	95 Liberty St., New York.
Cincinnati	May 12, 1918			H. Boutet	101 Carew Bldg, Cincinnati, Ohio.
New England	Apr. 9, 1918	Brake Conditions in General Freight Service and Their Relation to Shocks and Breaks-in-two	H. F. Wood	W. E. Cade, Jr.	683 Atlantic Ave., Boston, Mass.
New York	Apr. 19, 1918	Thermit Welding; Illustrated with Moving Pictures	R. L. Browne	Harry D. Vought	95 Liberty St., New York.
Pittsburgh	Apr. 26, 1918			M. J. Hepburn	102 Penn. Station, Pittsburgh, Pa.
St. Louis	Apr. 12, 1918	Another "Scrap of Paper"; Annual Reports and Election of Officers	Hon. James C. Jones	B. W. Frauenthal	Union Station, St. Louis, Mo.
Western	Apr. 15, 1918			Joseph W. Taylor	1112 Karpen Bldg., Chicago.

Torley Company of Pittsburgh, and a second contribution of $100 was received from the Chicago Railway Equipment Company, Chicago.

United States Government Locomotives

Specifications have been prepared by the Railroad Administration for eight types of locomotives:

Light and heavy mountain types.
Light and heavy Mikado types.
Light and heavy Pacific types.
Six-wheel and eight-wheel switching locomotives.

The director-general will determine the number of each type which will be ordered for use in the different regions. The proposed standard specifications for locomotives, although still subject to slight revisions, were given to locomotive builders some time ago and they have submitted their prices, which are being carefully scrutinized and checked. If the costs for any item seem high, the reason for it will be ascertained, and if necessary the Government will arrange to purchase certain materials for builders where it can do so more cheaply. A meeting was held at Washington on April 1 with the manufacturers of locomotive specialties to consider informally the specialties to be used on the standard locomotives to be ordered. A similar meeting will be held shortly with the manufacturers of car specialties. Detailed prices on the cars have been received and will be checked before a decision is reached as to the number of each type to be ordered.

MEETINGS AND CONVENTIONS

Electric Hoist Manufacturers' Association.—This association was recently formed by manufacturers of electric hoists in the United States for the purpose of co-ordinating the total experience of the various manufacturers and to make available for the user all that is best in electric hoist design. The membership of the association is confined to those engaged in the manufacture of monorail electric hoists. The officers of the association are: H. A. Hatch, chairman, Shepard Electric Crane & Hoist Company; F. W. Hall, vice-chairman, Sprague Electric Works, and C. W. Beaver, secretary-treasurer, Yale and Towne Manufacturing Company.

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations:

AIR BRAKE ASSOCIATION.—F. M. Nellis, Room 3014, 165 Broadway, New York City. Convention May 7 to 10, 1918, Cleveland, Ohio.

AMERICAN RAILROAD MASTER TINNERS', COPPERSMITHS' AND PIPEFITTERS' ASSOCIATION.—O. E. Schlink, 485 W. Fifth St., Peru, Ind.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Karpen Bldg., Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—R. D. Fletcher, Belt Railway, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa. Annual meeting June 25-28, 1918, Hotel Traymore, Atlantic City, N. J.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth St., New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andreucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawlor Ave., Chicago. Second Monday in month, except June, July and August, Hotel Morrison, Chicago.

CHIEF INTERCHANGE CAR INSPECTORS' AND CAR FOREMEN'S ASSOCIATION.—W. R. McMunn, New York Central, Albany, N. Y.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, C. H. & D., Lima, Ohio.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—J. G. Crawford, 547 W. Jackson Blvd., Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1126 W. Broadway, Winona, Minn.

MASTER BOILERMAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Karpen Bldg., Chicago.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—George A. J. Hochgrebe, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, third Wednesday in month, Statler Hotel, Buffalo, N. Y.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. R. R., Cleveland, Ohio. Next meeting, September 10, 1918, Chicago.

PERSONAL MENTION

GENERAL

W. F. ACKERMAN, shop superintendent of the Chicago, Burlington & Quincy, at Havelock, Neb., was appointed acting superintendent of motive power of the lines west of the Missouri river, succeeding T. Roope, granted leave of absence.

E. C. ANDERSON, mechanical engineer of the Colorado & Southern, with headquarters at Denver, Colo., has been appointed assistant mechanical engineer of the Chicago, Burlington & Quincy, with office at Chicago.

H. P. ANDERSON, mechanical engineer of the Missouri, Kansas & Texas of Texas, was appointed superintendent of motive power, with headquarters at Denison, Tex., succeeding F. W. Taylor.

B. J. PEASLEY, whose appointment as mechanical superintendent of the St. Louis-Southwestern of Texas, with office at Tyler, Tex., was announced in the February issue, was born at Decorra, Ill., on December 21, 1867. He entered railway service at the age of 16 as laborer and machinist apprentice with the Chicago, Burlington & Quincy, at West Burlington, Ia. On completing his apprenticeship he entered Elliott's Business College, at Burlington, Ia. After completing the business course he again entered railway service as a machinist with the Atchison, Topeka & Santa Fe, at Ft. Madison, Ia. In 1894 he was employed by the Ft. Madison Gas & Gasoline Engine Company; from 1895 to 1899 he was employed by the Chicago, Ft. Madison & Des Moines, as fireman and engineer. From 1899 to 1901 he was employed by the Illinois Central, at East St. Louis, Ill., as a machinist and was later promoted to division and wrecking foreman, at Carbondale, Ill. In 1901 he entered the service of the Denver & Rio Grande, as roundhouse foreman at Helper, Utah, where he remained a short time, returning to the Illinois Central, at East St. Louis, Ill., where he served in the capacity of roundhouse foreman, shop foreman and general foreman until September, 1906. He was appointed general foreman of the Missouri Pacific, at Bixby, Ill., in September, 1906, and was later promoted to master mechanic, at Ferriday, La., where he remained for six months and was then transferred to De Soto, Mo., as master mechanic of the Missouri division. In February, 1914, he was promoted to superintendent of shops at Argenta, Ark., where he remained until promoted, as noted above.

B. J. Peasley

WALTER U. APPLETON, general master mechanic of the Canadian Government Railways, with office at Moncton, N. B., has been appointed superintendent motive power with office at Moncton, succeeding C. R. Joughins, who was superintendent of rolling stock. Mr. Appleton was born on January 29, 1878. On October 1[illegible], 1890, he obtained a position with the Canadian Government Railways as a junior clerk

in the insurance office and worked there until 1894, when he secured a transfer to the locomotive department as machinist apprentice. On the completion of his apprenticeship he was transferred to the office of the superintendent motive power as a clerk, after which he was employed in the shop for one year as machinist. In 1903 he was promoted to the position of chief clerk to the superintendent motive power and was appointed assistant superintendent motive power in 1909. In 1913 he was appointed general master mechanic.

F. W. TAYLOR, superintendent of motive power of the Missouri, Kansas & Texas, with headquarters at Denison, Tex., has been appointed general manager, with headquarters at Parsons, Kan., succeeding H. F. Anderson, who was transferred to San Antonio, Tex., as superintendent of terminals of the Missouri, Kansas & Texas of Texas.

R. A. WINSER, engineer of tests and fuel inspector of the Chicago & Alton, with headquarters at Bloomington, Ill., resigned on April 1.

W. H. WINTERROWD, assistant chief mechanical engineer of the Canadian Pacific, has been appointed chief mechanical engineer to succeed W. E. Woodhouse, who has resigned. His headquarters are at Montreal, Que.

MASTER MECHANICS AND ROAD FOREMEN OF ENGINES

WILLIAM EARLE BARNES, master mechanic of the Canadian Government Railway at Moncton, N. B., has been appointed general master mechanic, succeeding W. U. Appleton, with headquarters at Moncton, N. B. He was born on July 24, 1879, at Shediac, N. B., and was educated in the public schools. He began railway work on April 20, 1899, as draftsman apprentice on the Canadian Government Railways. In 1902 he served as draftsman, and in 1906 first as machinist and later as draftsman. In October, 1907, he was appointed fitter and in January, 1909, again served as draftsman. In April, 1910, he was appointed enginehouse inspector and the following January became acting master mechanic. He was appointed master mechanic in September, 1912, and since August, 1917, was acting general master mechanic until his recent appointment as general master mechanic as above noted.


William Earle Barnes

ARTHUR CROHN has been appointed general master mechanic of the Missouri, Kansas & Texas, with headquarters at Denison, Tex.

C. O. DAVENPORT, road foreman of engines of the Chicago, Burlington & Quincy, with office at Alliance, Neb., has been appointed master mechanic, with office at Sterling, Colo., succeeding G. O. Huckett.

T. DEVANEY has been appointed master mechanic of the Toledo, St. Louis & Western, with office at Frankfort, Ind.

J. L. FAGAN, master mechanic of the Denver & Rio Grande at Grand Junction, Colo., has been appointed master mechanic of the fourth division, with headquarters at Alamosa, Colo., succeeding H. C. Stevens.

G. O. HUCKETT, master mechanic of the Chicago, Burlington & Quincy, with office at Sterling, Colo., has been appointed master mechanic, with office at Alliance, Neb., succeeding J. G. Dole, resigned.

T. W. MCBEATH, traveling fireman of the Canadian Government Railways, with office at Moncton, N. B., has been appointed master mechanic, with headquarters at Moncton.

F. T. OWENS, assistant master mechanic of the Denver & Rio Grande, at Pueblo, Colo., has been appointed master mechanic, with office at Grand Junction, Colo., succeeding J. L. Fagan.

CHARLES RAITT, whose appointment as master mechanic of the Atchison, Topeka & Santa Fe Coast Lines at Needles, Cal., was noted in the March issue, was born on January 16, 1862, at Montrose, Scotland. His railroad service dates from 1882, when he obtained employment with the Canadian Pacific as a machinist. In 1887 he secured a position as gang foreman with the Chicago & Atlantic at Huntington, Ind., where he remained until 1889, when he went with the Northern Pacific as machinist at Brainerd, Minn., and was later promoted to general foreman. He was next with the Canadian Northern as general foreman and master mechanic at Winnipeg, Man., until the latter part of 1902, and was then employed by the Great Northern on air brake department work at St. Paul until 1904. He has been with the Atchison, Topeka & Santa Fe since that time, first as erecting shop foreman at Albuquerque, N. M., and from 1908 until he received his recent appointment, he was general locomotive foreman at Richmond, Cal.

F. W. SCHULTZ, master mechanic of the Kansas City, Mexico & Orient of Texas at San Angelo, Texas, has also been assigned the duties of superintendent motive power and car departments of the Kansas City, Mexico & Orient, the latter office having been abolished. In addition to headquarters at San Angelo, he will maintain office at Wichita, Kans.

W. B. STOKES has been appointed master mechanic of the Wrightsville & Tennille, with headquarters at Tennille, Ga., succeeding M. G. Brown.

SHOP AND ENGINEHOUSE

THOMAS B. DICKERSON has been appointed acting superintendent of shops of the Central of New Jersey, with office at Elizabethport, N. J., succeeding G. L. Van Doren, resigned.

H. C. STEVENS, master mechanic of the Denver & Rio Grande at Alamosa, Colo., has been appointed superintendent of shops at Burnham (Denver), Colo.

PURCHASING AND STOREKEEPING

W. F. LAMB has been appointed division storekeeper of the Southern Railway, with office at South Richmond, Va., succeeding J. E. Angel, promoted.

THOMAS SPRATT, assistant purchasing agent of the Norfolk & Western, with office at Roanoke, Va., will perform the duties of purchasing agent.

W. F. WRIGHT has been appointed assistant to the purchasing agent of the Louisiana & Arkansas, with office at Texarkana, Ark.

A. H. YOUNG, tie and timber agent of the Seaboard Air Line, with office at Hamlet, N. C., has been appointed general storekeeper, with office at Portsmouth, Va., succeeding D. D. Cain, resigned to accept service with another company.

OBITUARY

WILLIAM C. KENT, general foreman of the Georgia Southern & Florida at Valdosta, Ga., died on March 28, 1918.

SUPPLY TRADE NOTES

A. J. BEUTER, representative of the Baldwin Locomotive Works at San Francisco, Cal., has been transferred to Portland, Ore.

W. S. BARTHOLOMEW, president of the Locomotive Stoker Company, has been elected vice-president of the Westinghouse Air Brake Company in direct charge of the activities of the stoker company and to attend to such other duties as may be assigned to him. Mr. Bartholomew received his education in the public schools of Chicago and in the North-Western University. He entered business life with George B. Carpenter & Co., leaving that company to enter the service of Adams & Westlake, in course of time becoming eastern manager. In 1903 he entered the service of the Westinghouse Air Brake Company as New England representative at Boston, Mass. He remained here until 1905 when he was made western manager of the same company at Chicago. He was transferred in 1913 to the Locomotive Stoker Company, being elected president, and ever since has actively directed the development of the Street stoker and its distribution to the railroads throughout the country. In addition to his new position he still retains his former office of president of the Locomotive Stoker Company.

W. S. Bartholomew

W. D. HORTON, circulation manager of the Simmons-Boardman Publishing Company, publishers of the *Railway Mechanical Engineer*, resigned on March 1 to accept a position as district railway sales manager of the Patton Paint Company with headquarters at Milwaukee, Wis. Mr. Horton was born in Brooklyn, N. Y., December 3, 1880, and was educated in the public schools of that city. On June 1, 1908, he joined the staff of the Simmons-Boardman Publishing Company, and from 1908 to 1914 acted as a traveling subscription representative, on April 1, 1914, being appointed circulation manager. Mr. Horton has had a wide selling experience, having spent several years, previous to 1908, selling various commodities such as stationary engines, boilers, wood-working and other machinery. In this work he traveled extensively throughout the United States, Canada, Mexico, Cuba, the West Indies, and in South and Central America. As circulation manager, he obtained a wide personal acquaintance among executive officers and department heads of nearly all the railways in the United States and Canada.

W. D. Horton

THE UNITED STATES RUBBER COMPANY recently announced the purchase of the plant of the American Locomotive Company at Providence, R. I.

The BETTENDORF COMPANY has waived its patent rights on truck sides and underframes for the duration of the Government control of the railroads.

RICHARD W. BAKER, superintendent of outside construction of the Watson-Stillman Company, New York, died on March 24 at his home in Roselle, New Jersey. Mr. Baker was 68 years of age.

The H. W. JOHNS-MANVILLE COMPANY advises that its office in Memphis, Tenn., has been removed to 804-805 Exchange building, at Madison Avenue and Second Street in that city.

The ASBESTOS PROTECTED METAL COMPANY, Pittsburgh, announces the appointment of HERBERT LONGSTAFF as manager of its St. Louis office, located in the Boatman's Bank building.

R. J. HIMMELRIGHT has been elected vice-president of the American Arch Company. In his new position Mr. Himmelright will have charge of the service and road development work in the United States and Canada. Mr. Himmelright was born at Wadsworth, Ohio, and received his grammar and high school education at that place. Upon leaving high school he attended Wooster University for two years as a special student. Completing this work he entered Purdue University, graduating with the degree of mechanical engineer. While at Purdue University he specialized in railroad work. Immediately upon graduation he entered the service of the Lake Shore & Michigan Southern as a special apprentice. His work with the Lake Shore, while wholly in the mechanical department, covered a wide and varied field and gave him unusual opportunity to study locomotive operation. Leaving the Lake Shore he entered the service of the Locomotive Stoker Company as mechanical expert. In 1913 he accepted a position with the American Arch Company as traveling engineer and was made successively assistant to the manager of the service department and manager of the service department, which position he held at the time of his recent election.

R. J. Himmelright

COLONEL HENRY P. BOPE has resigned his position as vice-president and general manager of sales of the Carnegie Steel Company, effective April 1, 1918. He has been succeeded by WILLIAM G. CLYDE.

W. O. DUNTLEY, president of the Chicago Pneumatic Tool Company, Chicago, resigned on April 1. He will retain his interest in the company and will also remain a director and a member of the executive committee, and will continue to assist in an advisory capacity. No successor to Mr. Duntley

has been elected, but J. G. Osgood, first vice-president, will act as president.

FRANK J. HURLEY, who for a number of years was a representative connected with the New York office of the Independent Pneumatic Tool Company, died in East Orange, N. J., March 10, at the age of 29 years.

The PERMUTIT COMPANY, manufacturers of water softening and water rectification apparatus and for several years past located at 30 East Forty-second Street, New York, has announced the removal of its headquarters to 440 Fourth Avenue.

The GALENA SIGNAL OIL COMPANY is to establish a large manufacturing and distributing plant at Houston, Texas, having bought the refinery and pipe lines of J. S. Cullinan for a consideration said to approximate $10,000,000.

R. S. COOPER, who for several years had been in charge of the New York office of the Independent Pneumatic Tool Company, has been elected vice-president and general sales manager. He will have his headquarters in the Thor building, Chicago.

ROBERT E. FRAME, for the past six years assistant to the president of the Haskell & Barker Car Company, Michigan City, Ind., resigned on March 1, and has been elected vice-president of the Hutchins Car Roofing Company, with office in Detroit, Mich.

W. F. WAGNER, after 52 years' service, has severed his connection with William Jessop & Sons and now has become sales manager of the Seaport Steel Company. This company specializes in the manufacture of carbon tool steel and forgings, high-speed steel, alloy and carbon sheet steel and all varieties of high-grade steel.

H. D. SAVAGE has been elected vice-president of the Locomotive Pulverized Fuel Company. He will also continue as vice-president of the American Arch Company. Mr. Savage was born at Memphis, Tenn. He was educated in the public schools at Ashland, Ky., and at the Kenyon Military Academy. He started his business life with the Ashland Fire Brick Company in the manufacturing department, serving in various capacities. Later he was appointed manager of sales, and during his ten years in this position he made great strides towards putting the manufacture of high grade refractories on a scientific basis. He was largely instrumental in making Ashland the most modern brick plant in the country at that time, introducing many features making for uniformity of product and increased output. Together with the late E. S. Hitchens he organized the Refractory Manufacturers' Association, of which he was elected the first president. This association includes in its membership practically all the manufacturers and users of refractory materials. Mr. Savage's work as sales manager gave him opportunity to thoroughly study the application of refractories to the metallurgical field, and he enjoys a wide acquaintance in the metallurgical industry of this country. In 1914 he was elected vice-president of the American Arch Company in charge of manufacturing. In this position he organized the manufacturing department of this company so that close supervision by trained inspection is given the fire brick at the Arch company's plants. This resulted in higher grade brick and greater service life. In 1917, in addition to his duties as vice-president of the American Arch Company he was appointed manager of sales of the Locomotive Pulverized Fuel Company.

H. D. Savage

J. L. PRICE, assistant to the chairman of the board of directors of the Chicago Pneumatic Tool Company, Chicago, was recently elected vice-president in charge of finances. He was also re-elected assistant to the chairman of the board of directors and in that capacity will continue to act as the representative of the chairman.

GEORGE W. WILDIN has resigned as general manager of the New York, New Haven & Hartford to enter the employ of the Westinghouse Air Brake Company as general manager of the Locomotive Stoker Company, with headquarters at Pittsburgh, Pa. He brings to his new position extensive railroad experience and a well rounded out mechanical and managerial career. Born at Decatur, Ill., February 28, 1870, he studied at the city schools and was graduated from the Kansas State Agricultural College in June, 1892, with the degree of Bachelor of Science. He entered railway service shortly afterwards as mechanical draftsman in the Topeka shops of the Atchison, Topeka & Santa Fe. He subsequently became a machinist and a locomotive fireman on the Santa Fe and later an engineman on the Mexican Central. Leaving railway service he was for a time superintendent of the Aermotor Company, of Chicago. He soon returned to railway service, however, as an engineman on the Chicago & Alton, and then went to the Plant System, now a part of the Atlantic Coast Line, where he served successively as a machinist, locomotive and car inspector and as mechanical engineer. From April 1, 1901, to March 1, 1904, he was mechanical engineer for the Central Railroad of New Jersey. On March 1, 1904, he left that company to become assistant mechanical superintendent of the Erie, being promoted on April 1 of the same year to mechanical superintendent at Meadville, Pa. From January to July, 1907, he served as assistant superintendent of motive power of the Lehigh Valley, and then left that road to accept the position as mechanical superintendent of the New Haven. In May, 1917, he was promoted to general mechanical superintendent, and in September of the same year was again promoted to the position of general manager. Mr. Wildin was president of the American Railway Master Mechanics' Association in 1910.

George W. Wildin

PAUL T. IRVIN, who has been associated with the Wells Brothers Company, and the Greenfield Tap & Die Corporation for 12 years, has resigned his position as sales manager of the gage division to accept the position of general sales manager of Lincoln Twist Drill Company, of Taunton, Mass. EDWARD BLAKE, Jr. (formerly of Wells Brothers Company), is vice-president and general manager of this company, and FRANK O. WELLS, president, and FREDERICK H. PAYNE,

vice-president of the Greenfield Tap & Die Corporation, are directors.

ERNEST BAXTER, general storekeeper of the Wabash, with office at St. Louis, Mo., resigned on March 1, to become manager of railroad sales for the Kansas City Bolt & Nut Company, with office in Kansas City, Mo. A photograph and biographical sketch of Mr. Baxter's business career appeared on page 364 of the June, 1917, issue of the *Railway Mechanical Engineer.*

G. R. LEWIS, division freight agent of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Indianapolis, Ind., and for more than twenty years with the New York Central Lines, has been appointed manager of supplies and traffic, with the Standard Forgings Company of Indiana Harbor, Ind. He will have offices in the Railway Exchange building, Chicago.

W. L. REID has been elected vice-president and general manager of the Lima Locomotive Works, Inc., with offices at Lima, Ohio. Mr. Reid was born at Paterson, N. J. His entire business life has been connected with locomotive building. He served his apprenticeship in the drawing office and shops of the Rogers Locomotive & Machine Works at Paterson and became successively erecting shop foreman, assistant superintendent and superintendent of the same plant. Leaving the Rogers works he was appointed assistant superintendent of the Brooks Locomotive Works, and two years later superintendent of the Brooks works. After serving only 20 days in the latter position he was appointed superintendent of the Schenectady works of the American Locomotive Company. He was later appointed manager of the Schenectady plant and general works manager of the American Locomotive Company. Resigning from the American Locomotive Company, he became general manager of the National Brake & Electric Company, Milwaukee, Wis. Six months later he resigned to become general superintendent of the Baldwin Locomotive Works at Eddystone, which position he held up to the time of his recent election.

W. L. Reid

IRA C. ROGERS, formerly general purchasing agent for the Worthington Steam Pump Company at New York, has been appointed general manager of W. R. Keene & Co., also of New York. W. R. Keene & Co. represent the Bay State Tap & Die Company, Alvord Reamer & Tool Company, Sterling Products Company, Keene Twist Drills and Massey Vise Company.

G. W. BICHLMIER has recently become associated with the machinery department of the Walter A. Zelnicker Supply Company, St. Louis, Mo. Mr. Bichlmier was formerly associated with the supply departments of the Missouri Pacific and Kansas City Southern and was secretary-treasurer of the W. L. Sullivan Machinery Company.

In the semi-annual report of the AMERICAN LOCOMOTIVE COMPANY, which was recently published, it was stated that the Richmond and Montreal plants of the company, which had been engaged exclusively on munitions work since 1915, finished their munitions work last year and the work of restoring those plants for locomotive manufacture was completed during October, 1917.

THE CHICAGO PNEUMATIC TOOL COMPANY is doing four times as much business as in the pre-war period, according to its annual report for the year ended December 31, 1917, recently made public. In addition, the net profits have exceeded those of any previous year, even after providing for an additional tax of 4 per cent on the company's net income and for the excess profits war tax. The company's plants have been taxed to capacity to fill the orders which have been received and it has been necessary to make improvements and additions to the plant.

LOYALL A. OSBORNE, vice-president of the Westinghouse Electric & Manufacturing Company, and chairman of the executive committee of the National Industrial Conference Board, has been appointed by the Secretary of Labor a member of a committee on industrial peace during the war. This committee, which consists of five representatives of employers, five labor leaders, and two public men, will provide a definite labor program in order that there may be industrial peace during the war, thus preventing interruption of industrial production vital to the war.

H. J. TIERNEY, president of the Tierney Supply & Lumber Company, Chicago, has been appointed representative for the Grip Nut Company, Chicago, with office at 1742 Railway Exchange building, St. Louis, Mo. Mr. Tierney began railway service with the Missouri, Kansas & Texas, on March 5, 1888, as apprentice coppersmith. He was appointed mechanical engineer in 1907, and was promoted to superintendent of the car department in January, 1916, with headquarters at Denison, Texas, which position he resigned on January 1, 1918, to become president of the Tierney Supply & Lumber Company.

KARL J. EKLUND has been appointed general manager of Mudge & Co., in charge of the engineering and manufacturing departments, with headquarters at Chicago. Mr. Eklund was born on July 8, 1884, and was educated in the grammar and high schools of Keene, N H He started his railroad service as a blacksmith helper in the Boston & Maine shops, and from March, 1903, to April, 1906, served his apprenticeship as machinist on that railroad. During the next two years he was employed on various railroads as journeyman machinist, and in 1908 returned to the Boston & Maine as machinist and foreman in the Keene, N. H., shops. On March 1, 1910, he left the service of this road to accept a position with the Pilliod Company, of New York and Swanton, Ohio, as Baker valve gear inspector, and on February 1, 1915, he was appointed assistant to the president of the Pilliod Company, with headquarters at New York. He occupied this position until April 1, 1917, when he was appointed assistant to the president of Mudge & Co., Chicago, the western representatives for the Pilliod Company, and served in this capacity until his appointment as general manager on March 1, 1918. In this capacity he will con-

Karl J. Eklund

tinue to direct the service departments of the Pilliod Company and the Chambers Valve Company, both of whom are represented in the west by Mudge & Co. He will also have charge of the service department of Mudge & Co. in addition to the engineering and manufacturing departments.

W. L. ROBINSON, supervisor of fuel consumption, Baltimore & Ohio, has resigned to accept a position in the operating department of the E. I. du Pont de Nemours Company, Wilmington, Del. Mr. Robinson is one of the best-informed men in railway fuel matters and is at the present time vice-president of the International Railway Fuel Association and the Smoke Prevention Association.

American Car & Foundry Company

A. E. OSTRANDER, mechanical engineer at the New York office of the American Car & Foundry Company, has been made general mechanical engineer, and will have general supervision over all mechanical matters, reporting to J. M. BUICK, vice-president and general manager. Mr. Ostrander's promotion has made necessary a number of other changes in the engineering department, the more important of which are as follows: H. C. LUNGER has been made assistant to the general mechanical engineer with headquarters at New York. FRED G. WOLFF has been made mechanical engineer, with headquarters at St. Louis, Mo. NORMAN LITCHFIELD has been made mechanical engineer, with headquarters at New York. JOHN G. MCBRIDE has been made engineer of car construction, with headquarters at New York, and will report direct to the general mechanical engineer. H. P. FIELD has been made assistant engineer, with headquarters at Berwick, Pa., and will report to the engineer of car construction. W. L. YOCUM has been appointed assistant engineer, with headquarters at Chicago, and H. D. DISTELHURST, assistant engineer, with headquarters at Washington. W. H. SELDEN and J. D. THOMPSON have been made assistant engineers, with headquarters at New York, and W. J. ROA, assistant engineer, with headquarters at St. Louis, Mo.

A. E. Ostrander

Mr. Ostrander was born and educated in New Haven, Conn., and during his school vacations worked in various departments of the New York, New Haven & Hartford. He entered the drawing room of the New Haven in 1897 and was later employed by CORNELIUS VANDERBILT in designing cars, car trucks and other railway appliances. For a time he worked as a car designer and checker for the Standard Steel Car Company at Pittsburgh, and in September, 1902, entered the service of the American Car & Foundry Company at New York and was successively employed as designer, estimator, and chief estimator. In February, 1904, he was made assistant mechanical engineer, and on October 1, 1915, was promoted to the position of mechanical engineer at the New York office. He has been closely identified with the development of steel cars and especially steel passenger cars. Since the outbreak of the war, he has given considerable time to special work for the Government and has served on the committee of engineers from car building companies that has been engaged in designing the standard freight equipment for the United States Government.

CATALOGUES

JOURNAL PACKING.—A new kind of car waste that is kept elastic and in contact with the journal by means of interwoven brass spring wire is described in a pamphlet issued by the Elastic Car Waste Company, Philadelphia, Pa.

REINFORCING BARS.—The Cambria Steel Company, Philadelphia, has issued a 24-page illustrated booklet describing the Cambria slick concrete reinforcing bar. This booklet contains detailed information concerning the properties of this bar and data of value in designing structures in which it is to be used.

TOOL HOLDERS.—Under the title of "How to Save Money on High Speed Steel," the Gisholt Machine Company, Madison, Wis., has issued a pamphlet showing three kinds of tool holders which may be used to advantage with high speed tool bits made by drawing out pieces of high speed steel which would otherwise have been scrapped.

MILLING CUTTERS.—The "Stock List of Cutters" issued by the Cleveland Milling Machine Company, Cleveland, Ohio, under the date of March 15, 1918, contains a list of the different kinds and sizes of milling cutters made by that company. Various kinds of angular cutters, end mills, slotting and concave cutters are also listed.

ACETYLENE WELDING.—A four-page leaflet has been issued by the Alexander Milburn Company, Baltimore, Md., describing two portable oxy-acetylene welding and cutting outfits. The leaflet is called "Machinery Repairs," and contains several pertinent illustrations of the saving effected in repairing broken machinery by the oxy-acetylene process.

DYNAMIC BALANCE.—The Norton Grinding Company, Worcester, Mass., has issued "A Treatise on Dynamic Balance" which will be of interest to all who do not understand the difference between the standing and running balance of machine parts which revolve at a high speed. The need of a running balance and a special machine to test it is made evident.

TURRET LATHES AND TOOL GRINDERS.—Some interesting machine work that is being done economically on turret lathes is shown in a bulletin entitled "Increasing Production with Gisholt Machines," issued by the Gisholt Machine Company, Madison, Wis. The well known advantages of a good tool grinder are also explained and the arguments advanced in this booklet are exceptionally clear and convincing.

RIVET CUTTING.—A booklet called "Flexible Rivet Cutting Gun" (Book No. 2), is being circulated by the Rivet Cutting Gun Company, Cincinnati, Ohio. It shows how, by the use of the gun, much time can be saved in cutting rivets in boiler seams and in doing other railway repair work. The gun strikes a much harder blow than can be struck with a sledge, and it can be used in cramped and inaccessible places. In the back of the book is a list of parts and complete instructions for assembling and repairing.

BORING MILL CHUCKS.—The Commonwealth Supply Company, Richmond, Va., has issued a pamphlet called "The Moss Universal Chuck," which shows in detail how this chuck may be used on a vertical boring mill intended to handle railway shop work. It is particularly applicable to the boring of main rod brasses, driving boxes and piston valve bull rings. The chuck centers the work automatically both ways, which eliminates much of the laying out. Clamping is also unnecessary and the work may be turned over without removing it from the chuck, in case it is desired to face off both sides.